

New Floral Records in the Region of Southern Jerusalem Hills, Palestine

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Abstract

Palestine has a rich floristic and vegetation diversity due to its geography, topography, as well as the high climatic, lithologic, and edaphic diversity. Our current knowledge of the floral biodiversity within the West Bank is based upon literature data and the observed field records of Al-Sheikh; yet these data do not provide information regarding the location or the distribution range of the plant species. Data were accumulated and updated based upon field observations (Herbarium of Palestine Institute for Biodiversity and Sustainability), published and unpublished available records, and biodiversity databases (BioGIS and GBIF). These studies focus on the southern hills of Jerusalem because it is a newly declared protected area and falls within the Mediterranean key biodiversity areas. Eight significant floral species are notable records and are reported herein: *Crepis reuteriana* Boiss, *Crepis robertioides* Boiss., *Fallopia convolvulus* L., *Fumana scoparia* Pomel, *Glaucium flavum* Crantz, *Sambucus ebulus* L., *Samolus valerandi* L., and *Coronilla cretica* L. *Crepis robertioides* Boiss. is an endangered species according to the IUCN Red list and its population is decreasing globally and locally; *Sambucus ebulus* L. and *Fallopia convolvulus* L. which is an adventive species (Dufour- Dror and Fragman 2019) are recorded in the West Bank for the first time. The remaining species are rare and recorded from new localities. Specimens of the species have been deposited at the Herbarium of Palestine Institute for Biodiversity and Sustainability.

Keywords: Protected area, Flora, Endangered, Adventive species, Palestine.

Introduction

Historic Palestine (Israel and the Occupied Palestinian Territories or West Bank and Gaza Strip) has a unique geography located at the intersection of three continents in addition to its distinctive geology being part of the Great Rift Valley harbouring the lowest point on earth. Palestine is part of the Fertile Crescent, where the domestication of animals and plants happened some twelve millennia ago (Neolithic; Abbo and Gopher 2020). Palestine has five phytogeographical and five ecological zones, which resulted in a quite diverse rich floral and faunal biodiversity. The flora of Historic Palestine is diverse extending over an area of 22,000 km², comprising 2600 plant species (Thorogood 2019). Studies of floral diversity in the West Bank are accelerating (Qumsiyeh and Al-Sheikh 2023; Al-Sheikh and Qumsiyeh 2021a; Al-Sheikh and Qumsiyeh 2021b; Pahl and Qumsiyeh 2021). The floral diversity in Palestine can be attributed to the climatic history, geography, and geologic changes, for Palestine sits at the southeastern tip of the Mediterranean ecosystem, bordering the vast Saharo-Arabian desert belt to its south and connected via the Rift Valley to the heights of Southeast Asia and the dry tropical ecosystems of East Africa (Soto-Berelov *et al.* 2015). The rate of floral endemism is about 7% (Thorogood, 2019).

The biodiversity is threatened by climate change, habitat destruction, pollution, overexploitation of natural resources, introduction of invasive species which penetrate natural habitats and displace the native floral and faunal species, anthropogenic changes of land confiscation procedures by the Israeli occupation, building illegal settlements, building of bypass roads, and the closure of roads and large areas in the

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West Bank for security reasons. This all leads to habitat degradation and fragmentation as well as the restriction in the range of occurrence of native species resulting in the loss of biodiversity (Tal 2018; ARIJ 2016; Husein and Qumsiyeh 2022; Qumsiyeh and Abu Sarhan 2021; Qumsiyeh and Amr 2016). A new protected area network has been created for the state of Palestine (West Bank and Gaza). One of the areas newly designated is a valley system enclosing a number of towns and villages to the south of Jerusalem called Al-Arqoub (Qumsiyeh *et al.* 2023a). The area includes a UNESCO World Heritage Site (landscape) and is part of the Mediterranean biodiversity hotspot (MOTA 2015). It is also being considered to become the first biosphere reserve in the area. The present paper documents the presence of significant floral records as well as rare species from this area which will be helpful in further conservation efforts.

Methods

Study Area

The study area consists of five studied localities, which are: Cremisan, Al-Makhrou, Battir, Husan, and Wadi Fukin. These areas fall within the Mediterranean key biodiversity areas. The southern Jerusalem Hills region includes several villages (Al-Khader, Battir, Husan, Al-Walaja, and Wadi Fukin) in addition to several wadis (Makhrou, Cremisan, Husan and Fukin) with a rich cultural heritage and rich biodiversity. The study area (Figure 1) is found within the Mediterranean biogeographical zone and forms a critical portion of the hydrological system that replenishes the western aquifer. It is an important bird area and an important plant area (Radford *et al.* 2011).

Much of the studied area is located in Area C of the occupied West Bank, which means it is under the Israeli civil and military control

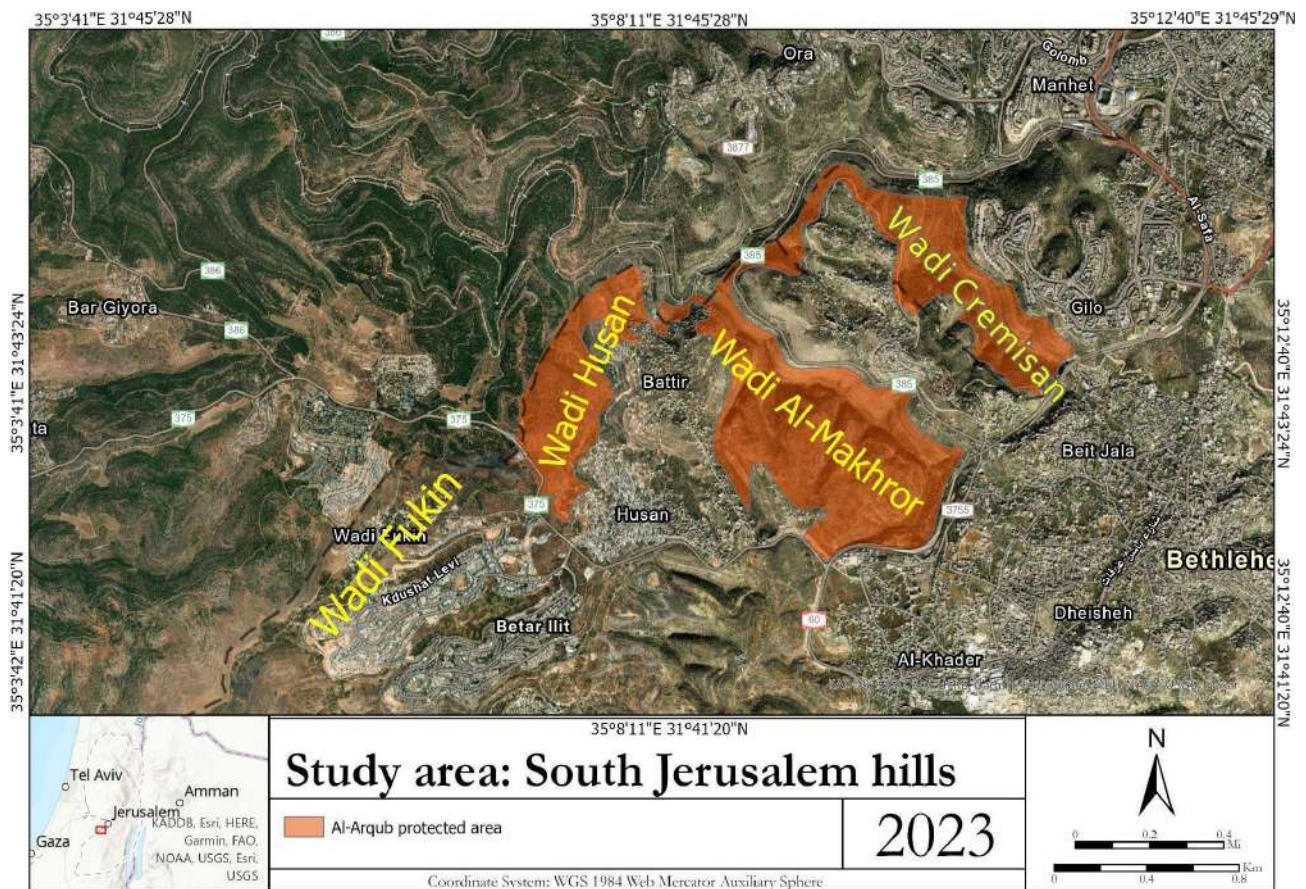


Figure 1: The study area of the southern Hills of Jerusalem (which falls within the newly designated protected area of Al Arqoub); it includes four valleys: A) Cremisan Valley, B) Al- Makhrou Valley, C) Battir/Husan valleys; D) Wadi Fukin Valley; the map was designed specifically for this research paper by our team member Duaa Husein at the Palestine Institute for Biodiversity and Sustainability.

(Qumsiyeh *et al.* 2023a). Part of the area was designated as a threatened UNESCO World Heritage Site (MOTA 2015), and recently much of it is designated as a protected areas re-evaluation (Qumsiyeh *et al.* 2023b).

Data collection: Through the conduction of various field trips, data were collected and the above-mentioned species were documented and their geographical distribution has been updated and recorded in the Al Arqoub region of the West Bank. Such information was either not reported earlier or was dubious and is now confirmed as present and recorded within the region. The floral species' inventory for Wadi Al-Makhrou, Battir, Husan and Wadi Fukin was done based on field trips where floral species were surveyed via meticulous walking in the targeted areas between Spring 2021 and Spring 2022. The classification of plants as far as rarity is based on Al-Sheikh's and Qumsiyeh's list (Al-Sheikh and Qumsiyeh, 2021c). The coordinates of the floral species provided are based on the longitude and latitude of the Global Positioning System (GPS) mapping. Altitudes are given in metres above sea level. Locality data were compared with data from Danin (2015) and GBIF (Horvitz and Danin, 2015). However, the latter includes many amateur reports not confirmed by botanists. Pictures of plants were taken in the field, and some samples were collected and deposited into the herbarium of the Palestine Museum of Natural History and are labelled as PMNH-Hxxxx (which refers to Palestine Museum of Natural History Herbarium). Conservation status was referenced to IUCN (2023) and Sayah *et al.* (2020).

Results

The results of this study confirm that eight taxa in seven families are hereby recorded in the West Bank which were either not reported earlier or were dubious and now confirmed as present in this contested part of Palestine.

***Crepis robertioides*, Boiss, Robertia Hawkweed; Compositae, Figure 2(a)**

Record: Observed specimen, Makhrou, Bethlehem Governorate (31.713778,

35.168855), 798m, 15 June, 2022. Perennial herb which reaches up to 15 cm, with a woody stem. The plant spreads across a width of 20 cm. Leaves; alternate, typical rosette leaf, dissected, less than 10 mm wide, entire with smooth margins, absent stipule. Florets yellow, less than 15 mm in diameter, self-pollinating only. The outer involucre bracts are shorter than its inner bracts. Its inner bracts harden and spread apart after the inner seeds' dispersal. Deciduous. It is considered as an endangered species according to the IUCN Red List of Threatened Species 2020 see table 1 (IUCN 2023; Sayah *et al.* 2020). *Crepis robertioides* Boiss. is found in the extreme north in Majdal Shams, Jabal Alshaikh (Mt. Hermon) as well as the Syrian Golan heights (Danin 2015, <https://flora.org.il/en/plants/CREROB/> and <https://biogis.huji.ac.il/eng/searchspecies.html>). Within the Golan Heights (Syrian Occupied Territory), it was ostensibly recorded by Ofra Friedmann who collected a specimen in Tel-Aviv University Herbarium on 13 July, 2020 (Horvitz 2016). The record provided through this study is far to the south of these localities and is the first record in the West Bank.

***Glaucium flavum*, Crantz, Yellow Horned Poppy; Papaveraceae, Figure 2(b)**

Record: PMNH-H0287, Wadi Fukin (31.7073N, 35.1042E), 645 m, 16 June, 2021 Observed specimen, Wadi Fukin, Bethlehem Governorate, (31.708588N, 35.120448E), 645 m, 20 June, 2022 Observed for another time at the same location on 24 June, 2023

Glaucium flavum is a blue-grey, branched biennial to perennial, 30-90 cm. Leaves 15-30 cm with oblong, wavy and pinnately lobed leaves, the upper leaves clasping the stem; stems with a yellowish latex when cut. Flowers bright yellow; petals 30-40 mm long. Fruit narrowly cylindrical, long and narrow, 15-30 cm; curved and hairless but with small whitish tubercles. Mediterranean strand, Coastal sands and shingle, or disturbed habitats inland. It is considered as a very rare Near Threatened species, it could have escaped cultivation, thus it is found in the southern Hills of Jerusalem as its normal habitat is the Mediterranean Sea strands.



Figure 2. a) *Crepis robertioides*, Boiss., b) *Glaucium flavum*, Crantz., c) *Coronilla cretica*, L. d) *Samolus valerandi* L.

No historical observation has been recorded for it in the West Bank, however it has been observed within the area south of the West Bank (Danin 2015, <https://flora.org.il/en/plants/GLAFLA/>). This species has been red-listed as a near threatened species (Sapir *et al.* 2003).

Glaucium flavum is documented to be found in Jordan as indicated in the Jordan plant red list by (Taifour, 2017), and in the coastal Mediterranean strands such as Galilee, Acco Plain, Coast of Carmel, Sharon Plain, Philistean Plain. Moreover, there are several observations within the Judean mountains which are considered as the normal habitat of this floral species within the Mediterranean

strand (Danin 2015, <https://flora.org.il/en/plants/GLAFLA/> and <https://biogis.huji.ac.il/eng/searchspecies.html>). The record provided through this study extends the distribution of this species within the West Bank.

***Coronilla cretica*, L., Cretan Crownvetch; Fabaceae, Figure 2(c)**

Record: Observed in Makhrou, Bethlehem Governorate (31.714003, 35.168139), 790m, 5 April, 2022.

Coronilla cretica is a virtually hairless annual with weak stems 15-60cm, branched from the base. Leaves with 3-6 pairs of oblong-elliptic, blunt leaflets. Flowers in heads of 3-6, borne on straight stalks; corolla 4-7mm,

Table 1. shows the IUCN and regional status of the floral species.

Scientific Name	Family	IUCN Red list Status (IUCN, 2023) Status in Jordan (Taifour, 2017)	Local Status in West Bank (Al-Sheikh and Qumsiyeh, 2021c)
<i>Crepis reuteriana</i>	Compositae (Asteraceae)	- LC in Jordan	Rare
<i>Crepis robertioides</i>	Compositae (Asteraceae)	Endangered (in the Mediterranean region and Globally) Decreasing	Very Rare
<i>Fallopia convolvulus</i>	Polygonaceae	- Endangered in Jordan	Very Rare
<i>Fumana scoparia</i>	Cistaceae	-	Very Rare
<i>Glaucium flavum</i>	Papaveraceae	LC (Europe) LC in Jordan	O= It is found only in 1-3 sites in the West Bank
<i>Sambucus ebulus</i>	Caprifoliaceae	LC (Europe) Critically endangered in Jordan	Very Rare
<i>Samolus valerandi</i>	Primulaceae	LC (in the Mediterranean region, Globally and in Europe) LC in Jordan (Taifour 2017)	Rare
<i>Coronilla cretica</i>	Fabaceae	-	O= It is found only in 1-3 sites in the West Bank

white or pink flowers and straight erect fruits (Zohary and Feinbrun- Dothan, 1966-1986, Thorogood, 2019). It is very rare within the Judean Mountains.

Coronilla cretica has the following geographical distribution where it is common in Hula Plain, Upper Galilee, Mount Carmel, whereas it is very rare within Kinnroth Valley, Coastal Galilee, Acco Plain Nablus (Samaria) and the Judean Mountains (Zohary 1972; Danin 2015 <https://flora.org.il/en/plants/SECCRE/>). The record provided in this study is the first record in the West

Bank as its presence in the West Bank has not been confirmed before as no specific localities were given before.

***Crepis reuteriana*, Boiss., Reuter's Hawk's Beard; Compositae, Figure 3(d)**

Record: PMNH-H0369, Makhrou, Bethlehem Governorate (31.713300, 35.168600), 798 m, 2 April, 2022.

Perennial rhizomatous herb, 30-100 cm. Rhizome woody with numerous fibrous roots. Stems glabrous or crisp- pubescent, erect, long- branched, paniculate- corymbose. Leaves pubescent or hispidulous; radical



Figure 3. a) *Fallopia convolvulus*, L., PMNH-H0715, b) *Sambucus ebulus*, L., PMNH-H0451 c) *Fumana scoparia*, Pomel, PMNH-H0368, d) *Crepis reuteriana* Boiss, PMNH-H0369.

leaves petiolate, runcinate- pinnately lobed with retrorse oblong- triangular acute lobes; 1-2 lower cauline leaves similar to radical leaves, the others linear- lanceolate, entire. Heads medium- sized. Involucre calculator, 1-1.3 cm, usually glabrous; inner involucral bracts linear- lanceolate, in fruit thickened at base. Florets yellow. Achenes beakless, 3.5-5 mm, greenish

or tawny, straight or nearly so, weakly ribbed. Pappus is hardly longer than achene, deciduous (Feinbrun-Dothan, 1978, Thorogood, 2019).

Crepis reuteriana Boiss. is documented to be found in Jordan as indicated in the Jordan plant red list by (Taifour, 2017), the Syrian Golan heights, and in historic Palestine in the Galilee region, including Mount Carmel.

It is reported as being very rare in the south of West Bank (Feinbrun- Dothan 1978, Danin 2015 <https://flora.org.il/en/plants/CREREU/>; <https://biogis.huji.ac.il/>) this record has confirmed its presence in the West Bank.

***Fallopia convolvulus*, L., Black Bindweed; Polygonaceae, Figure 3(a)**

Record: PMNH-H0715, Husan Ayn Al Hawiyeh, Bethlehem Governorate (31.715556, 35.129167), 690 m, 16 June, 2021.

An annual climber, clockwise- twining, climbing or prostrate vine up to 1 m with angular stems. Leaves; alternate, heart or arrow- shaped, pointed and mealy beneath, 30-70mm long with smooth margins. Flowers have 8 stamens, styles 3, greenish or yellowish- white, borne in loose clusters in the leaf axils. Fruit a triangular nut borne on a short stalk 1-3 mm long. Its normal habitats are ruderal and bare places.

Fallopia convolvulus is new to Jordan as indicated by Al- Eisawi. Also, it is listed as an endangered species in Jordan as indicated by the Jordan plant red list by Taifour; where it is distributed in Wadi Araba and the Jordan Valley see table 1 (Taifour, 2017). Locally, it is found in the north in Majdal Shams, upper Galilee, Mount Carmel; it is reported as being very rare in the mountains near Jerusalem (<https://flora.org.il/en/plants/falcon/> and <https://biogis.huji.ac.il/eng/searchspecies.html>). The record confirmed its presence in the West Bank.

***Fumana scoparia*, Pomel; Cistaceae, Figure 3(c)**

Record: PMNH-H0368, Makhrou, Bethlehem Governorate (31.713300, 35.168600), 798m, 13 April, 2022.

Fumana scoparia differs greatly from the other two local *Fumana* species by the semiterete and unveined leaves, sparsely hairy and deciduous, alternating in a whorl pattern and looking like a rosette from above, and by the thick and smooth green sterile branches, bearing small scars from their fallen leaves. Flowers 25-30 mm in diameter, petals bright yellow (<https://flora.org.il/en/plants/fumsco/>). A small, finely hairy- stemmed shrub which reaches up to 35 cm similar to *Fumana thymifolia* but

more prostrate and with linear leaves 12-18 mm all alternate; stipules absent with many erect flowering stems 40-80 mm curved in bud with 2-3 flowers, inflorescence is very sticky- glandular- hairy.

Fumana scoparia is found in Galilee including Mount Carmel, Shefela, the Judean Mountains to the west of Jerusalem (<https://flora.org.il/en/plants/fumsco/>).

The exact localities of this recorded species were not known before in the West Bank, upon the conduction of this research; it is now confirmed as present in the West Bank within the southern Hills of Jerusalem.

***Sambucus ebulus*, L., Dane Weed; Caprifoliaceae, Figure 3(b)**

Record: PMNH-H0414, Husan, Bethlehem Governorate (31.716717, 35.133280), 622 m, 18 October 2020 PMNH-H0451, Ayn Battir, Bethlehem Governorate (31.727505, 35.138478), 662m, 19 August 2021.

A robust, vigorous, herbaceous perennial to 1.5(2)m with erect, grooved stems; unpleasant-smelling. Leaves pinnately divided with 7-13 narrow leaflets and conspicuous oval stipules at the base. Flowers borne in flat-topped inflorescences with 3 main rays; pinkish-white, with purple anthers. Fruit a black berry. Stream sides and field boundaries (Thorogood 2019).

Sambucus ebulus is documented to be found in Jordan (Ajloun) as indicated in the Jordan plant red list volume II by Taifour. It is considered as a critically endangered species, see table 1 (Taifour 2017). It was recorded as present in Jabal Al Shaikh (Mount Hermon) (<https://flora.org.il/en/plants/SAMEBU/> and <https://biogis.huji.ac.il/eng/searchspecies.html>). The record provided via this study is the first record in the West Bank extending the distribution of this species significantly. It is worth noting that because of its spotty and limited distribution and rarity in Palestine and Jordan, it requires urgent conservation measures.

***Samolus valerandi* L., Seaside Brookweed; Primulaceae, Figure 2(d)**

Record: PMNH-H0306, Husan, Bethlehem Governorate (31.717772, 35.128252), 648 m, 16 June, 2021. Also observed for the second time at same location on 18 June, 2022.

A hairless perennial herb with a rosette of leaves 10-15 mm long, and erect flowering stems 50mm- 70cm. Leaves are rather shiny, spoon-shaped and scarcely stalked below; stalkless above. Flowers small and white, cup-shaped to just 3 mm across and with 5 petals. Fruit 3 mm.

Perennial herb, 20-80cm, glabrous, glaucescent. Stems erect, leafy, simple or somewhat branched above. Leaves; obovate to spatulate, obtuse; basal leaves in a rosette, petiolate. Inflorescence a raceme; bracts small, acute; pedicles ascending, in fruit deniculate at the bract- insertion. Calyx campanulate; lobes erect, triangular, acute. Corolla white, 2-3 mm in diameter, somewhat longer than calyx; lobes obovate. Stamens included; staminodes subulate- triquetrous. Capsule 2-3 mm in diameter. Usually self-pollinating. Damp rocks and seeps, often coastal (Feinbrun- Dothan, 1978).

Samolus valerandi was recorded to be found in Jordan as mentioned by the Jordan plant red list volume II (Taifour, 2017) and is found in the coastal regions of Palestine, Upper and Lower Galilee, Judean Mountains, Upper Jordan Valley (Feinbrun-Dothan 1978, <https://flora.org.il/en/plants/samval/>). The record provided in this study confirmed the presence of this species in the West Bank although it is recorded as a very rare species in the mountains of this region.

In table 1; The status of each of the floral species locally, globally and in Jordan is depicted. *Crepis robertioides* is documented as an endangered species in the Mediterranean region as well as globally; and its population is decreasing (IUCN 2023; Sayah 2020). Furthermore, *Fallopia convolvulus* is considered an adventive species (Dufour-Dror and Fragman- Sapir 2019) and is documented for the first time in the West Bank. It is considered as a new species to Jordan according to Al- Eisawi as well as being an endangered species in Jordan as confirmed by the Jordan plant red list (Taifour 2017). Furthermore, *Sambucus ebulus* is considered as a critically endangered species in Jordan as indicated by the Jordan plant red list vol II (Taifour

2017). Hence, it is quite vital to document their presence in the West Bank of Palestine.

Discussion

Similar studies of the distribution and status of the floral species are highly needed for the betterment of planning and conservation measures and to protect this historic land's fauna and flora which have been neglected in light of the political and social challenges found within Palestine (Al-Sheikh and Qumsiyeh 2021c; EQA 2015; Qumsiyeh *et al.* 2017). Several rare species have been detected in this study within the newly designated protected area of the southern Hills of Jerusalem (Qumseyeh *et al.* 2023a). *Crepis robertioides* Boiss., which is considered as an endangered species according to the IUCN Red List of Threatened Species 2020 (Sayah *et al.* 2020) has been recorded along with *Fallopia convolvulus* L. and *Sambucus ebulus* L. which are recorded for the first time in the West Bank. This is an indication that the region of the southern Hills of Jerusalem should be subjected to further studies as it has the potential to be an eco-corridor. The area under study is facing numerous challenges, including habitat loss, land fragmentation and the difficult economic and political circumstances (Amr *et al.* 2016; ARIJ 2016; Husein and Qumsiyeh 2022; Qumsiyeh *et al.* 2014). Further study is being undertaken to protect the whole area under a Biosphere Reserve format because it is both a human cultural site as well as an eco- corridor for fauna and flora. This biocultural landscape is even more critical for our area considering the extensive threats that have been documented (Qumsiyeh and Abu Sarhan 2020; Al-Sheikh and Qumsiyeh 2021c; Qumsiyeh *et al.* 2023a).

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