Monitoring indicators of Al Makhrour Valley Report

Introduction

Wadi Al-Makhrour is a valley located about 7 km south of the old city of Jerusalem and about 6 km northeast of the old city of Bethlehem. It is connected to other valley systems stretches from the Walaja and Cremisan valleys to the South of Jerusalem and takes in the water of the Makhrour itself (between Beit Jala, Al-Khader, and Al-Walaja) to drain into the Battir and then Husan and Nahhalin valleys. Al-Makhroor is an important part of the system that refills the water aquifer of Bethlehem District area and the fresh water springs pass from the center of old trees plant there. The area is the last remaining biodiversity-rich area south of Jerusalem and in Bethlehem and Jerusalem districts.

"Biodiversity conservation and community development in Al-Makhrour Valley" project's objectives include the study of biodiversity in the valley (Fauna and Flora), habitats, and threats while promoting ecotourism, conservation and traditional agriculture. Biodiversity monitoring in the valley during the last three years has reflected one of the key aspects of the project. This document aims to identify the indicators that are measured/used to assess biodiversity before and after our intervention.

Methodology

The aim of this study is to compare data collected in $2018 \ge 2019$ with recent sets of data (2020/2021) and to use some key indicator elements from the areas that goes within the key habitat from map 1, this will focus on studying the fauna, flora and threats of the valley.

The initial round of data collection was done in 2018, while the next data collection takes place in late 2020 and early 2021. The monitoring tools were developed by experts and stakeholders after the 2018 initial survey of the valley flora, fauna, and overall ecosystems. The criteria included:

- 1) Monitoring certain keynote species (those of conversation interest) from the vulnerable groups like birds, mammals, and plants
- 2) Areas selected for regular monitoring included those areas identified as fragile or biodiversity rich habitats which may become threatened soon (Fig. 1)
- 3) We decided to monitor all threats and interventions in the valley from 2018.



Fig. 1: Biodiversity Conservation Areas of Priority at Battir WHP, Source: PCC

Assessment process for different groups/issues

Flora: All flora data will be collected from the survey that done by the PCC under the supervision of Mrs. Roubina Ghattas and her team for the flora and collect all data that goes with the key habitat areas and re-visit it in the year 2020\2021 and study it again in a way that we can compare it statistically to see any changes including rare species. Areas that will be focus on according to PCC work are the yellow triangles in Fig. 2 including some quadrants (all of this will be detailed later throughout our work). International experts were consulted (e.g. Ruediger Prasse).





Fig. 2 Important areas for flora in Wadiu Al-Makhrour (Above) and in Battir itself and Husan valley (below)

Fauna (excluding birds, see below): All our work will be focused on fauna data that collected from the key habitat areas that we agree on before, on a condition that these elements will be important indicator, as this we listed the following as indicators to be revisited and studied which could be easily compared:

- 1- Mammals: we study rodents using Sherman traps in a way we will do field works at the same time at the same places studied in the baseline field trips in 2018 (Fig. 3). We also took echolocation recording for bats near the same springs in 2018 and in 2020 and will continue monitoring bat assemblage changes. This is done near water springs especially Ein Emdan, and it takes place at the same season and nighttime to compare bats diversity. Large mammals (Mountain Gazelle, Hyena, Golden Jackals, and Foxes). were and are observed visually and using camera traps
- 2- Arachnids: a list of scorpion were collected that could be recollected and comparing results, and this will be done at night using UV lights.
- 3- Land snails are collected by hand. These species serve as indicators for habitat loss or degradation as well as climate change (e.g. rain acidity).



Figure 3. Map shows Sherman traps placing in Wadi AL Makhrour area.

Birds: Ornithologist Dr. Anton Khalilieh was contracted to do the initial survey in 2018 of birds focusing on resident species. He identified key birds to monitor in subsequent years in the key areas identified by him (Fig. 4). The initial survey (2018) was followed by another survey (2020/2021 winter season) that shows good bird habitats and maintenance of some species but threats to others (see report at https://bit.ly/3wKnHAr)

Fig. 4: Map shows points for the areas where birds observed and study.

Threats: After consultation, we agreed to monitor spacially and temporally all threats facing the valley. A detailed manuscript on current threats seen in 2019-2021 was



produced (can provide). Examples of threats include: Israeli occupation practices, local destructive agricultural practices, fires, solid waste, hunting, and urban sprawl.

Results

The following data are comprehensive finding from field trips conducted in Al Makhrour Valley for the Faunal and flora selected species for monitoring (monitoring species was based on expert analysis in focus group meeting of the biodiversity commttee. Field trips conducted in Al Makhrour Valley to continue for the second assessment for biodiversity and area conservation. 4 field trips done in 2020 at the exact dates that field trips conducts in 2018 for placing Sherman traps, night traps, and camera trap, other field trips in random days happened to collect several groups of fauna (insects, snails, and others), Moreover; several field visits done related to Mushroom collection.

Mammals: Sherman taps, camera traps, and night field visits done in 2020 to study the mammals fauna in al Makhrour and several results comes up like new data collecting and some species did not observed in the area were found in 2018, and new species observes in the survey of 2020 as the table shows.

Filed trips done in 2018 for mammals survey shows Sherman traps used and the found materials.

29.8.2018: 10 Sherman traps Caught 4 rodents in 2 species: Apodemus, Acomys 5.9.2018: 20 Sherman traps Caught 7 rodents in 2 species: Apodemus, Acomys 20.9.2018: 21 Sherman traps Caught 5 rodents 2 species: Apodemus, Acomys 12.10.2018: 24 Sherman traps Caught 9 in 2 species: Apodemus, Acomys

In 2020 survey

28.8.2020: 10 Sherman Traps: 1 spine mouse, other 10 traps around the area with (2 apodemus, and 3 spiny mouse)

3.9.2020: 20 sherman traps used and only one spine mouse

21.9.2020: 22 Sherman traps: (Apodemus 3, Acomys 2), in close area we use 7 traps with (Apodymus 2, Spiny Mouse 1)

12.10.2020: 30 Sherman traps: Apodemus 11, Acomys 5, Dipodillus dasyurus 1, Mus musculus 1

This is a curious finding indicating increase in rodent population and diversity. Either explainable by habvitat improvement or by decrease in predators like owls and raptors.

We did record hyenas using camera traps. The ghyena situation was monitored and reported on separately in a research paper (see Handal et al. 2019). Golden Jackals were observed with population of 5 individuals.

Family	Scientific	Common	2018	2020
	Name	Name		
Erinacidae	Erinaceus	European	X	X
	europaeus	hedgehog		
Soricidae	Crocidura	Bicolored	X	X
	leucodon	White-toothed		
		Shrew		

Table 1. Mammals of the valley. Note bats were identified strictly by echolocation data.

Pteropodidae	Rousettus	Egyptian fruit	Х	Х
Rhinopomatidae	Rhinopoma	Lesser Mouse-	X	X
	hardwicki	tailed Bat		
	Rhinopoma	Greater Mouse-	Х	Х
	microphyllum	tailed Bat		
Vespertilionidae	Pipistrellus	Kuhl's	Х	Х
	kuhli	Pipistrelle		
	Pipistrellus	Savi's Pipistrelle	Х	Х
	(Hypsugo) savi	_		
	Pipistrellus	Common	Х	Х
	pipistrellus	Pipistrelle		
	Otonycteris	Hemprich's	Х	
	hemprichi	long eared bat		
	Plecotus	Long-eared	Х	Х
	christiei	plecotine bat		
	Eptesicus bottae	Bottae's	Х	Х
	•	serotine		
Rhinolophidae	Rhinolophsus	Greater	Х	Х
1 I	ferrumequinum	Horseshoe Bat		
	Rhinolophus	Lesser	Х	Х
	hipposideros	Horseshoe Bat		
Molossidae	Tadarida	European Free-	Х	X?
	teniotis	tailed Bat		
Emballonuridae	Taphozous sp	Egyptian Tomb Bat	Х	Х
Muridae	Apodemus	Eastern broad-	Х	Х
	mystacinus	toothed field		
		mouse		
	Acomys	Spine Mouse	Х	Х
	cahirinus	-		
	Dipodillus	Wagner's gerbil		Х
	dasyurus			
	Rattus rattus	Black Rat	Х	Х
Hyaenidae	Hyaena hyaena	Striped Hyena	Х	
Bovidae	Gazella gazella	Mountain	Х	Х
	U	Gazelle		
Canidae	Vulpes vulpes	Red Fox	Х	Х
	Canis aureus	Golden Jackal	Х	Х
Felidae	Felis sp.	Wild Cat	Х	Х

Date	Species
28 Aug 2020	Pipistrellus kuhlii
	Pipistrellus pipistrellus
	Hypsugo savii
03 Sep 2020	Eptesicus bottae
	Hypsugo savii
	Rhinopoma microphyllum
	Pipistrellus kuhlii
	Pipistrellus pipistrellus
21 Sep 2020	Eptesicus bottae
	Hypsugo savii
	Taphozous nudiventris
	Pipistrellus kuhlii
	Pipistrellus pipistrellus
	Rhinopoma microphyllum
	Rhinolophus hipposideros
	Rhinopoma hardwicki
12 Oct 2020	Pipistrellus kuhlii
	Pipistrellus pipistrellus
	Rhinolophus hipposideros

Table 2: Most common bats at certain recording dates

Reptiles and Amphibians: In the beginning of the project we detected few species of reptiles and amphibians in Al Makhrour Valley, but in the survey of 2020 we found 5 species to add to our list, from our perspective we think more species are in the area but need other methods to observe them and collect, but what is important that some species that consider in bad status detected to have birding in the area (Mediterranean tortoise) which increase the important of Al Makhrour area as a place for wild animals to breed and kept in their natural habitat. The red-listed threatened spur-footed tortoise seemed to be doing well in the valley both in 2018 and 2020 (Fig. 5)

Family	Scientific Name	Common Name	2018	2020
Lacertidae	Phpenicolacerta laevis	Common Lebanon	Х	Х

	Ophisops	Elegant lizard	Х	X
	elegans			
Chamaeleonidae	Chamaeleo	Chameleon	Х	Х
	chamaeleon			
Agamidae	Stellagama	Agama	Х	Х
C	stellio	C		
Testudinidae	Testudo graeca	Mediterranean	Х	Х
		tortoise		
Gekkonidae	Hemidactylus	House Gecko	Х	Х
	turcicus			
Phyllodactylidae	Ptyodactylus	Fan Fingered	Х	Х
	guttatus	Gecko		
Scincidae	Ablepharus	Snake eyed		X
	rueppellii	Skink		
	Chalcides	Cylindrical		X
	ocellatus	Skink		



Figure 5: Testudo graeca mating in Al Makhrour Valley.

Scorpions: Scorpion kept the same with three species, especially around the agricultural areas in Wadi Al Makhrour and the trails, the most dominant species that we found in both 2018, and 2020 in the *Scorpio maurus*. This also indicate that human interaction with the environment did not affect the environment and the habitat in Wadi al Makhrour, especially in the spring water area, scorpions are sensitive for urbanization and could detect human affects (Olivero et al., 2021).

Family	Species	2018	2020
Buthidae	Hottentotta judaicus	Х	Х

Scorpionidae	Scorpio maurus	Х	Х
Diplocentridae	Nebo hierichonticus	Х	Х

Land Snails: Land snail were collected from AL Makhrour area with a total of 16 species. Granopupa granum, Buliminus labrosus, Paramastus episomus, Pene bulimoides, Euchondrus septemdentatus, Euchondrus chondriformis, Eopolita protensa jebusitica, Sphincterochila fimbriata, Monacha obstructa, Monacha syriaca, Monaca crispulata, Metafruticicola fourousi, Xeropicta krynickii, Levantina caesareana, Levantina lithophaga, and Helix (Pelasga) engaddensis.

Flora and Mushrooms: We published a recent paper on orchids which shows these species as present (many are locally threatened): Anacamptis papilionacea subsp. Palaestina, Anacamptis pyramidalis, Neotinea maculata, Neotinea tridentate, Ophrys iricolor, Ophrys cf. libanotica, Ophrys lutea var. galilaea, Orchis anatolica, Orchis galilaea. Data on flora comparing 2018 with 2020 can be found here: <u>http://bit.ly/2plr7wc</u> (plants beginning) & <u>https://bit.ly/3gJz9pu</u> (plants final)

Threats: Al Makhrour as the last green area in Bethlehem District and as a key biodiversity area is facing a lots of threats that could affect it environment and biodiversity, the Palestine Institute for Biodiversity and Sustainability team studied the area through out several field trips to indicated the threats facing the area (see table XX), this table shows all threats that we found in 2018 and in the survey of 2021, our team did several workshops for key stakeholders and locals around the Valley to reduce threats, signs related o biodiversity placed in the valley o shows visitors the important of the area and to keep it safe.

The most threating facts happened in the Valley is the changing of the natural look by the land owner which lead to environmental consequences (Fig 6), that could lead to change the rain water gathering area, bring invasive species (fauna and flora) from the outside soil, changing the soil chemistry from the outside stones that used to build the stone walls.

Threats	2018	2020
Overgrazing	X	X
Cutting trees	X	X
Burning	X	Х
Solid wastes	X	Х
Plowing the land in destructive ways	X	X
Farming infrastructure (stone walls and farm roads)	X	X
Use of insecticides/pesticides	X	?
People digging for heritage stuff	X	-
Too many unregulated visitors to the area	X	X
Stray dogs	X	?
Invasive species	X	Х
Occupation activities: walls around Al-Walaja and Khader	X	Х
Occupation activities: residential Jewish settlements and their attendant	X	X
infrastructure		

Different educational modules were done to increase awareness for local in different workshops and using awareness materials like signs in the Valley and brochures (Fig. 7)



Figure 6. Habitat destructing in Al Makhrour.





Figure 7. Brochures and signs made through this project to encourage conservation

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