

## Status and Conservation of the Striped Hyena (*Hyaena hyaena*) in the Occupied Palestinian Territories (West Bank)

Elias N. Handal\*, George H. Qumsieh, Shayma Y. Hammash and Mazin B. Qumsiyeh

**Abstract:** The striped hyena (*Hyaena hyaena*) in Palestine is one of the four living hyena species in the whole world. There have been no studies on the status of the striped hyena in the West Bank over the past twenty-five years. Therefore, this paper presents a detailed study based on data collection and field observations (including camera traps) that add to the existing knowledge about this unique carnivorous mammal. The researchers collaborated with the Environmental Quality Authority in the new animal rehabilitation unit which provided the researchers with both deceased and confiscated animals. The observations in this study significantly extend the distribution range of the hyena from the eleven localities reported earlier to over twenty localities. The study also discusses the educational efforts that were made to raise awareness and address the myths that allow people to kill hyenas, including the enforcement of the 1999 environmental law, and the prospects for the future of hyena populations. The researchers are cautiously optimistic concerning the future of this species especially in light of the education and awareness campaigns in addition to the more strict enforcement of laws by the EQA and the newly-established environmental police units. One challenge remains open which is the Israeli occupation that limits the accessibility of Palestinian officials to 60% of the West Bank which harbors some 90% of the hyena habitats in the Palestinian territories.

**Keywords:** *Hyaena hyaena*, Striped Hyena, Palestine, West Bank, Conservation.

### Introduction

Palestine's location between Europe, Asia, and Africa gives it a unique geography and geology that enhance the local biodiversity relative to other countries at the same latitude (Qumsiyeh, 1996). This country has five ecozones (the central highlands, the semi-coastal region, the eastern slope, the Jordan valley and the coastal region) and four biogeographical regions (Mediterranean, Irano-Turanian, Saharo-Arabia and Sudanian Penetration) (Amr *et al.*, 2018; Qumsiyeh *et al.*, 2016; Whyte, 1950; Zohary, 1945). Palestine used to have over 130 recorded species of land mammals a few millennia ago, but nearly twenty species became extinct, mostly the large ones (Meiri *et al.*, 2019). The Family Hyaenidae includes medium to large-size carnivores with only four extant species (*Crocuta crocuta*, *Hyaena hyaena*, *Hyaena brunnea*, and *Proteles cristata*) localized in Africa, southwest Asia and India (AbiSaid and Dloniak, 2015; Green, 2015; Wiesel, 2015; Bohm and Höner, 2015). Three subspecies of the striped hyena have been recognized, of which *Hyaena hyaena syriaca* is considered near-threatened globally and endangered locally (Qumsiyeh, 1996; Mendelsohn and Yom-Tov, 1999; Dolev and Perevolotsky, 2004; Meiri *et al.*, 2019). Because of their wide geographical distribution, the supposed distinguishing characters of the three subspecies intergrade significantly (Qarqaz *et al.*, 2004). *Hyaena hyaena* is distributed throughout Africa (except for the Southern parts), the Middle East including Turkey, Iran, Arab countries such as the Arabian Peninsula, the Levant, Iraq, and the Caucasus (Azerbaijan, Armenia, Georgia), and extends into the central Asia and into India (Kasperek *et al.*, 2004). The local status and conservation issues surrounding the striped hyena need

\*Corresponding author:

eliashandal93@gmail.com

Palestine Museum of Natural History; Palestine Instituted for Biodiversity and Sustainability –Bethlehem University, Bethlehem, Palestine

to be further studied and updated. The last overview conducted in the West Bank was about twenty-five years ago (Qumsiyeh, 1996). Herein, this study reviews the past and present distribution of the striped hyena in the Palestinian Territories and discuss some ecological and conservation issues focusing on the threats and the future for the striped hyena.

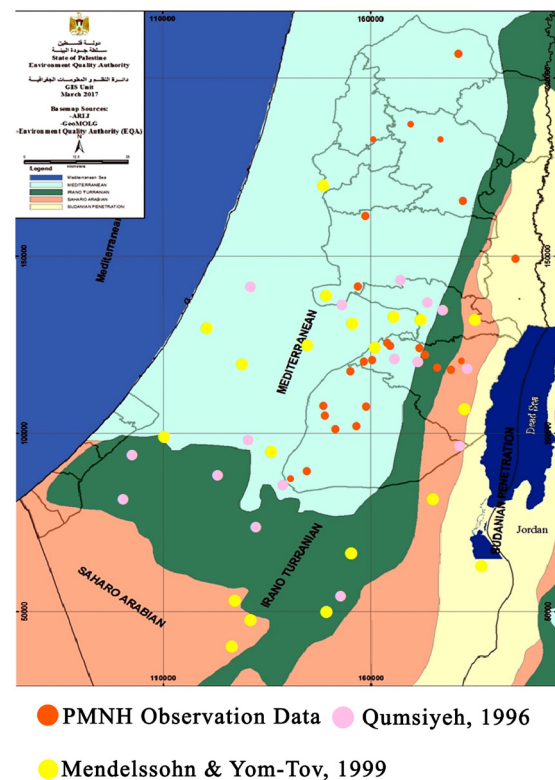
## Materials and Methods

The Palestine Museum of Natural History (PMNH) and Palestine Institute for Biodiversity and Sustainability (PIBS) were founded in 2014 at Bethlehem University, Bethlehem, Palestine with the aim of the conservation of habitats, fauna, and flora (Qumsiyeh *et al.*, 2017). The field teams of the PMNH/PIBS have engaged in data collection in the West Bank to improve the existing databases. Since 2018, additional data were collected using camera traps (Simmons Whitetail Trail Camera; Night Vision Camera) that were placed near water resources in Al Makhrouh for four times. Furthermore, the strengthening of law enforcement by the environmental police (newly established) by the Environmental Quality Authority (EQA) resulted in collecting new data in relation to both dead hyenas (e.g. road kills or confiscated from illegal hunters) and living animals for rehabilitation and release. The researchers also added occasional data from field observations documented with photos, date and location. All observations were catalogued in our database with GPS points for each observation including some data on the behavior and ecology of hyena. Maps were prepared using GIS, and the biogeographical map of Palestine of the Environmental Quality Authority (EQA) for the hyena distribution including some data of the past distribution of this species after Qumsiyeh (1996) and Mendelsohn and Yom-Tov (1999).

## Results

Observation localities and dates (Figure 1): Al Makhrouh (April, 2016; August, 2018), Osh Ghrab (May, 2019), Za'tara (June, 2019), Kusra (2016), Beit Sahour (January,

2009), Hebron (28.7.2015), Bait Laqya (23.8.2017), Dura Al Khalil (12.6.2013), Idna (6.1.2009), Cum village in Hebron (4.5.2013), Al Thahriya (9.4.2019), Sureef (24.3.2014), Deir Ghassana (7.9.2019), Wadi Rashayda (12.11.2013), Al Ojja (9.9.2014), Sa'er (3.3.2018), Nahaleen (15.5.2018), Jab'a (2013), Al Ramadeen (12.2.2020, Figure 2), Tarqumya/Wadi Al-Quff (16.2.2020), Jinsafout (1.2.2020), Wadi Ta'amrra (5.4 to 25.4.2020). Figure (1) demonstrates the distributions from previous records of Qumsiyeh (1996) and Mendelsohn and Yom-Tov (1999) and shows the new distribution observation by PMNH which seems to be clustered in the Southern part of the West Bank.



**Figure 1.** Striped hyena distribution in Palestine, using current and previous data from Qumsiyeh, 1996 and Mendelsohn and Yom-Tov, 1999.

This study, thus, doubled localities in the West Bank from eleven to twenty-one localities. The striped hyena has a wide distribution covering all biogeographical zones, and is highly adaptable to different habitats; something most likely attributed to its diet on carrion (Figure 1; Qumsiyeh 1996; Amr 2012). The striped Hyena is a medium-sized mammal with a robust jaw and large

sagittal crest that allows for a massive muscle attachment for crushing bones. The striped hyena has thirty-four teeth (dental formula M 3/3. Pm 1/1. C 4/3. I 1/1 see Qumsiyeh, 1996). Striped hyenas can reach >50 kg in weight as adults, and their total body length can be between 85 and 146 cm and tail length from 25 to 40 cm. A male and a female from areas of the West Bank were brought to the researchers by the EQA. The pregnant (older – estimated at 7-9 years old) female was from Al-Ramadeen having a total length of 146 cm, tail 31 cm, hind legs 22 cm, and the ears' length 16 cm. These are, by far, the largest measurements recorded for the striped hyena in this region. The male from Tarqumya was a young male (probably two years old) with a total length of 134 cm, tail 27 cm, hind legs 21 cm, and ears length 15 cm. The forelegs are longer and more powerful than the hind legs. The PMNH team made observations looking for the Striped Hyena during more than one-hundred field trips since 2014. Discussions were also made with locals, looking for hyenas and hyena tracks (dens, footprints) and occasionally using camera traps (Figure 2). All these observations support the notion that these animals are solitary and come together only for mating and when rearing their young ones. Only on two occasions, the researchers have observed hyenas together: On September 7, 2019, three were seen together (a mother and two near adult cubs) in Deir Ghassana, and in Wadi Ta'amra, A mother and one cub were located in April 2020. The latter case was interesting in that the locals reported seeing the pair several times from April 5 to April 25 in 2020. On one occasion, a shepherd reported seeing the hyena attacking a fox. A photograph was taken on a field visit to the site where two dead foxes were found after being eaten (Figure 4D). Camera traps were used in Al Makhroul Valley to detect Hyena near the water spring (Ain Imdan) (Figure 2).

On February 13, 2020, the EQA brought one female hyena that was killed by a poacher and dragged behind a car. Upon autopsy, this hyena was found pregnant with



**Figure 2.** The Striped Hyena from Al Makhroul Valley using a night camera trap.

a single male fetus (near full term) and the uterus showed no uterine scars of previous pregnancies (i.e. G1P0).

This case (Figure 3) provided a good educational model to discourage people over killing hyenas. The researchers reported the rehabilitation and the successful release of a young hyena. The EQA confiscated a hyena that was offered for sale on facebook. It was brought to the researchers on April 9, 2019. It was approximately a three-month-old hyena. A veterinarian injected the hyena with the rabies vaccine and checked its health. The researchers ensured that the female hyena was not to be released immediately (would have to be dependent on a mother for training). A special large secluded enclosure (about 10x15 m) was constructed in the ground in the PMNH botanical garden. The hyena immediately noticed the olive tree and start digging to make a shelter (Figure 4C). The hyena (dubbed Linda) was fed mostly animal remains and occasionally some vegetables and fruits, with minimal human contact. The decision was made to release the hyena during late winter/early spring because of its ability to defend itself (size and weight increased more 2 to 3 folds) and because of the availability of nutrients. The release location was a distant protected area far away from people to the west of Bethlehem District. The release date was February 26, 2020 (Figure 4A and B). The transportation cage was opened to the direction of the forest area and away from the populated areas. Immediately, Linda proceeded to walk casually in that direction



**Figure 3.** A: Hyena killed by a local from Al Ramadeen, B: A near-term male fetus from the dead female.

sniffing the ground and the air. On a visit week later, the researchers found tracks of the same hyena (judging by the foot print size) approximately 2 km to the west of the release site in the wooded areas near an outcropping of limestone dotted with caverns. The researchers left some food in the area one more time. This first-recorded successful release of

a rehabilitated hyena to the wild in Palestine served as an educational tool for people and was covered through mainstream news media (e.g. associated press: <http://www.aparchive.com/metadata/HZ-Mid-East-Hyena/bcb66d1bba1f43c181f6fbd5cbb92110>).

PIBS and PMNH became major centers for biodiversity research, conservation,



**Figure 4.** A-B striped Hyena released in an area to the West of Bethlehem District, C: The hyena dug under an olive tree in the enclosure during rehabilitation, D: A fox eaten by a hyena.

and environmental education and awareness in the Palestinian territories. Their efforts include animal rehabilitation and release. Their teams work with school students to create a new generation of people that respect nature to prevent and decrease infringements on wildlife. The successful story of rehabilitating and releasing a striped hyena to the wild (first of its kind in Palestine Figure 4) coupled with the pictures of the baby hyena (Figure 3) produced educational lessons. In fact, this was translated to an educational module to increase the awareness about the importance of protecting the hyena (Figure 5).

## Discussion

The striped hyena is globally considered near-threatened (NT) due to the decrease in its population according to the IUCN criteria (Meiri *et al.*, 2019; AbiSaid and Dloniak, 2015; Dolev and Perevolotsky, 2004). In Palestine, the striped hyena is considered as an endangered (EN) species due to the local threats that affect its existence and population numbers (Meiri *et al.*, 2019; Mendelssohn and Yom-Tov, 1999; Qumsiyeh, 1996). Human myths around hyenas go back to ancient times (Frembgen, 1998). The striped hyena is

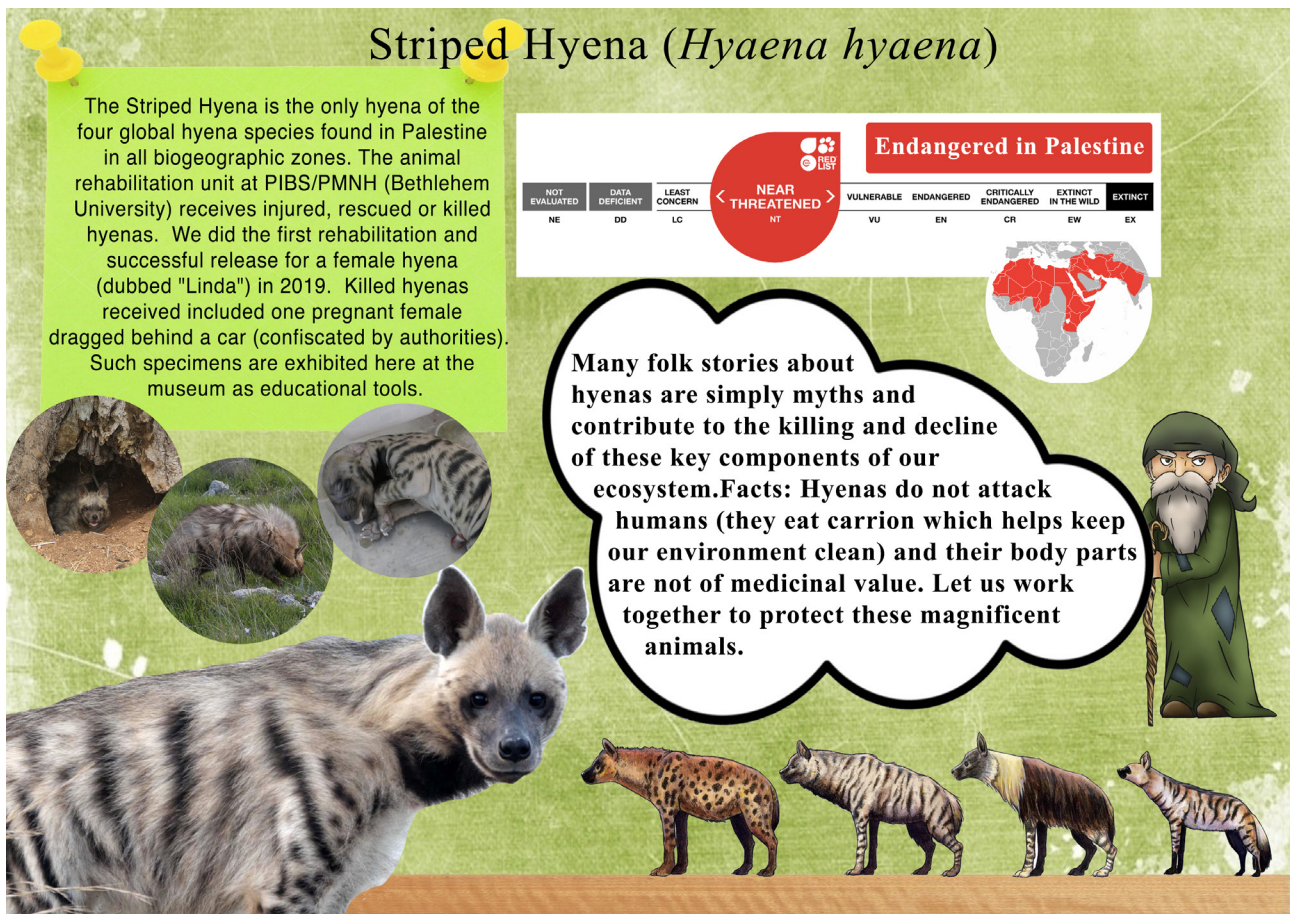


Figure 5. Hyena educational module prepared and exhibited at the Palestine museum of Natural History.

the species found in Palestine and adjacent areas such as Jordan. In the study area, there are many myths ranging from sorcery (Frembgen, 1998), to claiming humans hunt hyenas for the importance of certain hyena parts in curing illnesses (Qarqaz *et al.*, 2004; Frembgen, 1998).

The researchers heard from numerous sources in the study area that the hyena urinates on its victims including humans causing them to be drugged and then dragged to the den. These and other myths led to the illegal hunting of hyenas. Together with urbanization and climate change (including desertification spreading from the Saharo-Arabian region), habitats for all mammals have been shrinking. While hyenas are more adaptable than other carnivores such as wolves and leopards, the study anticipates their populations to be affected also (Amr, 2012). The practices of the Israeli Occupation including building the separating wall and colonial settlements further lead to habitat destruction and restrictions on the movement of hyenas (Adawi *et al.*, 2017).

Hyenas usually avoid human populations but the initial survey here and anecdotal evidence from locals indicate increasing human-hyena contacts. Striped hyenas are usually solitary animals and the three seen in Dair Ghassana together in September 2009 are probably a mother with two cubs. The same was noted with red foxes in Palestine. This is likely due to the destruction of habitats leaving fewer available food sources hence bringing the species closer in the sprawling urban areas. In 1999, the Palestine Environmental Law came into effect. In the past twenty years or more, much has changed in terms of environmental education and awareness. More recently, the Environmental Quality Authority (EQA) with the support of the "Environmental Police" started to enforce such laws. Hence, an increase in the number of rescued animals or deceased animals was noticed. Most importantly, there is an emerging tremendous interest in the conservation efforts by the new generation. The Facebook story about the killed pregnant hyena (Figure 3) had

over 55,000 views, and generated over one-hundred comments mostly from young people. The first successful release of a hyena in Palestine brought more publicity. Even the killed hyenas after taxidermy and exhibit at the museum with an educational module (Figure 5) provide new insight to visitors. A significant positive feedback was received on this issue from people even those who cannot visit the museum now (due to COVID-19 pandemic) but see posts on facebook or via emails. In light of this, the researchers are cautiously optimistic on the future of this species especially in light of education and awareness campaigns and the more strict enforcement of laws by the EQA and the newly established environmental police units in the Palestinian Authority Areas

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