Socio-economic sustainable development and environmental conservation at the northern transition zone to Wadi Qana Protected Area, Palestine

2018

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Contents

Summary

This project focused on a) the study of the ecosystems in the northern transition zone of Wadi Qana protected area including on looking for temporary rainfall ponds and studying the only currently known location of the Syrian spadefoot toad, b) develop a management plan that integrates population of Jinsafut and Al-Faruq with transition zone ecosystems (such as Jinsafut temporary pond with the endangered toad) and with the valley below (Wadi Qana), c) develop a management plan and recommendations that foster environmental education and conservation. Despite our efforts to locate other similar ecosystems, the Syrian spadefoot toad (*Pelobates syriacus*), which is already extirpated in Jordan, was found nowhere else in the West Bank except in the Jinsafut pond. We report on the pond's changes through the seasons and our studies of its flora and fauna. We managed to raise the tadpoles *ex-situ* and return them successfully. The Pond Water-crowfoot (*Ranunculus peltatus)* starts to grow in late January and early February then declines. The duckweed (*Lemna minor) also grow in the pond but* stays a bit longer. We did a SWOT analysis for this pond focusing on conservation. Strengths include its uniqueness and local interest; weaknesses include previous neglect; threats include Israeli colonial activities and Palestinian human activities; opportunities are high in research potential, ecotourism, and simple remedial measures that can help protect the site.

1. Introduction

Palestine is located between Eurasia and Africa and forms the western part of the Fertile Crescent where humans first developed agriculture (Qumsiyeh, 1996). The unique geography and geology gave Palestine more biological diversity than some countries ten times its size (Amr et al., 2018). The diverse habitats cover five ecozones: the central highlands, the semi-coastal region, the eastern slope, the Jordan valley and the coastal region. Palestine also spans four biogeographical regions (Mediterranean, Irano-Turanian, Saharo-Arabia and Sudanese-Ethiopian) (Whyte, 1950; Zohary, 1945).

Developing countries have significant challenges in environmental conservation and in developing their economies in sustainable ways that fulfil the UN 2030 sustainable development goals. Countries in conflict areas like Palestine are even more at a disadvantage. Research in the Palestinian Territories lagged behind nearby areas including in key issues like nature and agriculture (Qumsiyeh and Isaaq, 2012). Yet, we have shown that much can still be done with limited resources (Qumsiyeh et al., 2017). Palestine cannot wait until independence to protect its natural resources in the ways that developed and advancing developing countries have done it (with human empowerment and focusing on ecosystem services). Wadi Qana Protected Area (WQPA) is the third protected area (PA) in the Palestinian Territories that we envision having management plans developed for it in a scientific way after Wadi Quff and Wadi Zarqa Ulwi (PMNH, 2018). Yet, little attention has been paid to transition zones in PAs in Palestine. This collaborative project between the Environmental Quality Authority (EQA) and Bethlehem University's Palestine Institute for Biodiversity and Sustainability (PIBS) and Palestine Museum of Natural History (PMNH) was constructed to study and manage the northern rich transition zone of WQPA. This zone was already reported to include one locally endangered species (Syrian spadefoot toad, *Pelobates syriacus*) found in a rainfall temporary pond but nowhere else in the Palestinian Territories (Salman et al., 2014).

Rainfall temporary ponds in the Mediterranean region are disappearing at an alarming rate and are a priority habitat for protection according to the Natura 2000 network of the European Union (Zacharias et al. 2007; Zacharias and Zamparas 2010). These ponds are fragile because of unpredictable hydrology (Jakob et al., 2003) and habitat changes by agriculture and other human developments (Stoate et al., 2009)

Amphibians as part of the ecosystem play a significant role in monitoring environmental quality (Gibbons & Stangel, 1999). Worldwide there are not enough data about the status, distribution and threats to amphibians (Gibbons et al., 2000). In recent years environmental studies gained more significance due to threats that affect biodiversity in general and on the role of amphibians in particular (Kellert & Wilson, 1995). The urgency of studying ecosystems especially those associated with water has increased in recent years. Terrestrial amphibians in the world have six significant threats 1) habitat loss and degradation, 2) introduction of invasive species, 3) environmental pollution, 4) disease, 5) unsustainable use for the ponds (human

interaction), and 6) global climate change, all the above caused decline and extinction of the population (Gibbons et al., 2000). Terrestrial amphibians like toads depend on their breeding on temporary rainfall ponds which stay for a few months (Degani et al., 1983; Degani, 1982). *Pelobates syriacus* is a locally endangered species that needs rainfall ponds with particular crustacean ecosystem in our region (Munwes et al., 2010). *P. syriacus* was recorded in West Bank in one temporary pond in Jinsafut village that belongs to Salfit District (Munwes et al., 2010 & 2011; Salman et al., 2014).

Four tadpoles were collected from Jinsafut pond by the Palestine Museum of Natural History team on the first of June 2016, to observe their metamorphosis. The unique combination of geological and geomorphological features of Jinsafut pond allowed the winter rainfall water to stay from December to the middle of summer. This period is long enough for the *P. syriacus* tadpoles to complete the metamorphosis stage but any climatic or habitat changes could disturb this (Degani, 1983). In 2017 we did not see the species and this makes this study urgently needed. *P. syriacus* is considered a critically endangered species in Palestine and we do not want it to face the same local extinction experienced in Jordan.

The framework agreement between the Belgian Development Cooperation (DGD) and the Royal Belgian Institute of Natural Sciences (RBINS) "aims to contribute through its CEBioS (Capacities for Biodiversity and Sustainable Development) program to a better knowledge of biodiversity and biodiversity policy and a better implementation of international environmental conventions in developing countries." As part of this program, the Palestine Museum of Natural History was contracted to do a small project whose aims included: a) researching the zone to identify areas of special importance and threats, b) based on current and past published research and identified threats, develop long term monitoring (indicators include biodiversity richness, key indicator species like *Pelobates* and threats monitoring) and management plan for this zone (valorizing data), and c) work with local villagers (in Jinsafut and Al-Funduq) to enhance socio-economic well-being of local people focused on ecosystem services (benefits to local people from protection of both Wadi Qana protected area and the transition zone).

2. Materials and Methods

2.1. Study Area

Wadi Qana Protected Area (WQPA) is a valley in the northern West Bank located on the borders of Salfit and Qalqilia governorates (see Fig. 1). WQPA is rich in biodiversity according to unpublished data at PMNH but this biodiversity is threatened. WQPA is surrounded by eight Israeli colonies and eight ancient native Palestinian communities (on the hill area). Jinsafut village is located north WQPA and it is part of the buffer zone surrounding the protected area. There is a temporary rainfall-created pond that lasts from January to June between Jinsafut and Al-Funduq

(Fig. 2). The area is about 400-500 meters above sea level and characterized by mild Mediterranean climate.

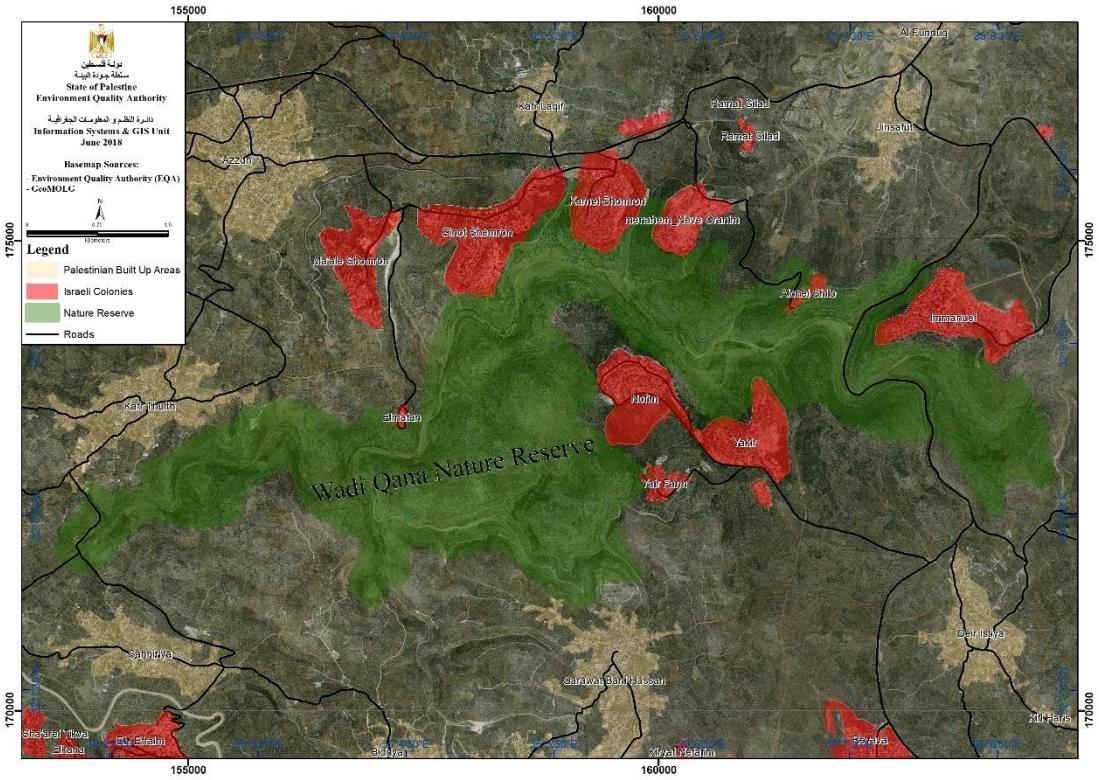

Figure 1. Wadi Qana Protected Area.

The village of Jinsafut (meaning ‘edge of vineyard’) is found in the northern buffer zone of the Wadi Qana protected area. The pond in question is called by the locals Uskur referring to a previous village located nearby that has been abandoned.

2.2. Methods of fauna and flora study

The previous visits to WQPA were done by the team of PMNH and included initial fauna and flora surveys by traditional methods. Literature review was done and shows that the area to the north of WQPA included a small rainfall fed pond called Uskur near Jinsafut with presence of spadefoot toad (*Pelobates syriacus*). Field trips and observation to the studied area were done intensively from February to May 2018 and added to observations of the site done earlier. We took data both quantitative (like pool measurements, water characteristics) and qualitative (like presence of species and human interactions). We also took newly hatched toad tadpoles and raised them *ex situ* to observe developmental stages. Aquatic macrophytes were observed and identified in late winter and early spring of 2018 and voucher specimens were taken as herbarium specimens. Notes and data were used by the team of PIBS/PMNH for the SWOT analysis.

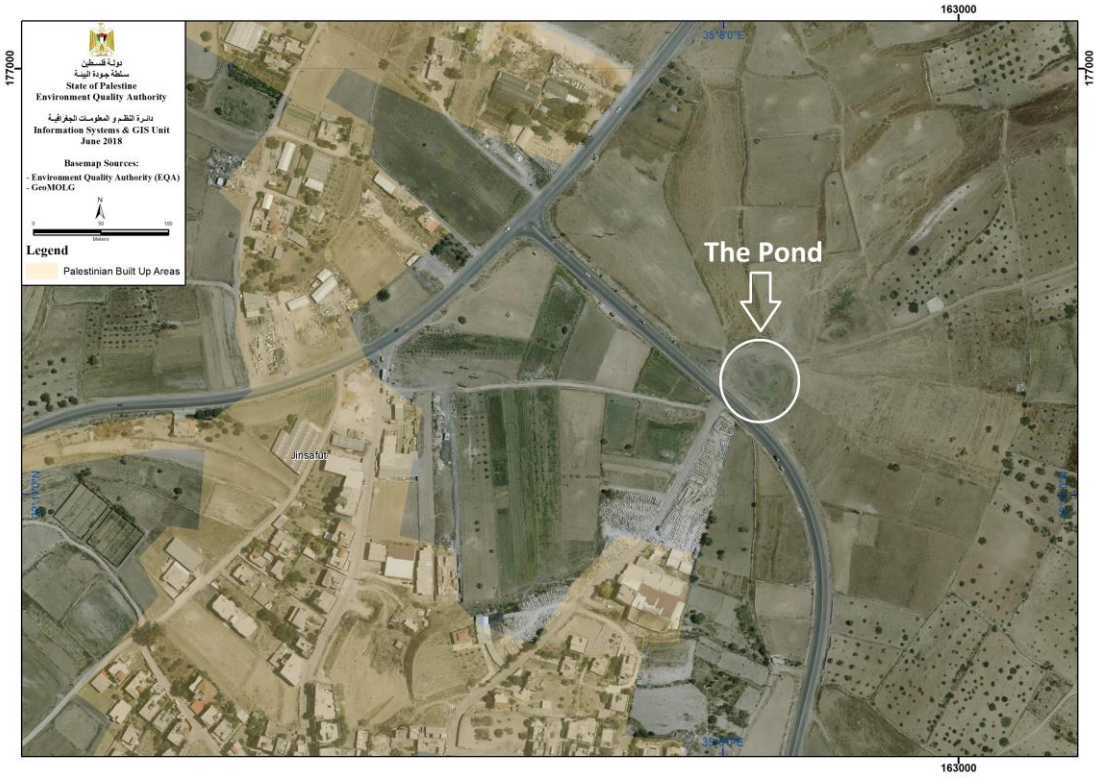

Figure 2. Location of the Jinsafut pond.

3. Results

Eight field trips were done to the area of the WQPA while also focusing on the buffer zones especially Jinsafut and taking side trips nearby. The discovery of a threatened species of toad (Syrian Spadefoot toad, *Pelobates syriacus*) and a rare species of aquatic plants (Pond Water-crowfoot, *Ranunculus peltatus*) shows the importance of protecting buffer zones and take steps to conserve such threatened species in the West Bank.

3.1. Survey for other ponds

In the beginning of the study, we carried out several field trips to observe Jinsafut pond when it was dry and as it started to accumulate water. We also surveyed the locals in several villages surrounding WQPA to understand if there are other ponds similar to Jinsafut pond. Two people plus the local village councils inform us that they had similar ponds in the past but farm developments had destroyed them.

Temporary water ponds were noted nearby but they did not last long enough to create suitable habitats like the Jinsafut pond. For example after a particularly heavy rain on 17 February 2018, we located fairly large ponds near Deir Istia (past Hares) and at the valley of Qana near the main road entrance to the protected area (Fig. 3). Both looked very promising but all the water disappeared by the next visit some two weeks later. This has to do with subsoil geologic structures that allowed water to stay in Jinsafut pond but quickly decline in other ponds.

Fig. 3. Temporary but short-lived water pond in the Wadi Qana area.

Two ponds were found in Haja village which is located to the northwest of Jinsafut. The ponds were artificially constructed for wastewater recycling and we did not note the presence of any amphibians (Figs. 4 and 5).

Fig. 4. Sign of the recycle water entrance in Haja village.

Fig. 5. Recycled water pond in Haja village.

3.2. Jinsafut Pond

Jinsafut pond is located in north WQPA in Jinsafut village and it is placed on Public property. Other ponds existed there but they were destroyed to use the land for farming. Water stays in the pond until the mid of June depending on the rainy fall season. Measurements of the pond were taken in February and in May (see Table 1). In February 2018, the area of the water surface was approximately 900 square meters and in the second measurement after 3 months the surface area reached 350 square meters which mean the water quantity decreased by two thirds which showed a significant change in the water surface of the pond. Figures 6 to 10 show the change of the water level in Jinsafut pond from July 2017 to June 2018. On 9 February 2018 the dissolved oxygen was 1 ml/l, PH 8.8, water temperature 18.1C, EC 345.

Fig. 6 The pool as it appears from July to December (photo Sept 2017)

Fig. 7. 20 December 2017 green grasses grow following rains but still not enough to get a pool, Ground soil moist. Photo towards the southeast.

Fig. 8. 22 January 2018 Beginning on water accumulation and beginning to hear adult toad emerge from aestivation. Photo towards the southwest.

Fig. 9. Peak size and peak floral period of the pond in February 2018. Photo towards the north

Fig. 10. 21 May 2018 pool drying up. Most flora is gone. Metamorphosed toads already digging into the soft wet edges of the pool. Photo towards the southwest.

Table 1. Measurements of the pond in February (maximum recorded) and May 2018. The shape of the pond is oval with an indentation on one side. The measurements were roughly lines drawn east to west (length) and north to south (width).

February 2018		May 2018	
Length/m	**Width/m**	**Length/m**	**Width/m**
33.6	14	4.9	18.8
33.7	22	14.7	22.8
35.5	27	24.4	22
37.6	30.4	27.4	19.5
38.3	31	30.3	14.3
35.7	33	25.5	12
28.7	28.8	19.1	11.3
23	26.5		

During the meetings of the museum team with the local residents and local authorities, we found that the reason this pond survived and not abandoned like other ponds is the cultural value of this pond for the people of this area. The people of the neighboring areas take a little bit of pond soil to put inside the houses or in the foundations to increase their sustainability in addition to the blessing of those buildings and their residents.

3.3. Flora and Fauna of the Pond

A survey was done in the Jinsafut pond for six months starting from January to June 2018. The pool started to collect rainwater in late December and significant accumulations happened in January but it was on our trips in February (specifically February 9) that we saw maximum size of pool, maximum floral assemblage, and we saw first evidence of amphibians.

FLORA: The plant life of the temporary pool habitat is an important part of its ecological community, often modifying the habitat and creating ecological niches (Jakob et al. 2003; Zacharias et al. 2007). In temporary ponds, the macrophyte cover has been shown to correspond with an increase in faunal diversity (Zacharias et al., 2007). Ecological services of temporary pool vegetation include habitat for amphibian egg-laying and food for arthropods and anurans (Jakob et al., 2003).

The abundance and mass of vegetation is affected by the size and inundation length of the pools, with larger and longer-lasting pools supporting more vegetation (Kiflawi, et al. 2003; Spencer et al. 2001). The species composition may also be influenced by variability in pool inundation, favoring the colonization by species adapted to reproduce under various water conditions (Carta, Bedini, Müller, & Probert, 2013; Grillas et al., 1993; Keeley & Zedler, 1998; Volder, Bonis, & Grillas, 1997). The temporary rainfall pond in Jinsafut supports aquatic plants which covered the pond through several months of 2018. The macrophyte community was comprised mainly of two species, *Ranunculus peltatus* Schrank and *Lemna minor* L.

***Ranunculus peltatus* Schrank Pond water-crowfoot**

The dominant macrophyte found in Jinsafut rainfall pond in Spring 2018 was *Ranunculus peltatus* Schrank, an obligate hydrophyte in sect. *Batrachium*. *R. peltatus* is a submerged, rooted aquatic plant with two growth forms: The first with laminate floating leaves, and the second with submerged capillary leaves (C.D.K Cook, 1966; Wiegleb, Bobrov, & Gałosz, 2017; Zohary, 1966). Like other members of this section, it shows high morphological and phenotypic plasticity that can be partially explained by differences chemical and physical environment (C.D.K Cook, 1966; Garbey, Thiébaut, & Muller, 2004; Wiegleb et al., 2017). This population consisted mainly of the capillary-leaved growth form, although a few laminate leaves were observed in February of 2018 (Fig. 1).

Ranunculus peltatus is native to Europe, Southwest Asia, and North Africa, including Israel and the West Bank. Throughout its range, it is found in ponds, pool, ditches, and seasonally inundated waters (C.D.K Cook, 1966; R. V. Lansdown, 2013; Wiegleb et al., 2017; Zohary, 1966). While common in temporary pools in the Eastern Mediterranean, it must be noted that these habitats are not frequent in the region and are decreasing in number due to climate change and human disturbance and land use (Zohary, 1966; Zacharias et al., 2007; Zacharias and Zamparas 2010). The ability of *R. peltatus* to produce seed when growing in various water levels means it is well-

adapted to the unpredictable inundation found in the temporary pool environment (Volder et al., 1997). This species growth, maturation, and decline depend on water chemical composition (Godfrey et al., 2004; Lumbreras et al., 2009).

R. peltatus is not threatened or endangered globally, but is protected or rare in some areas within its range (Lansdown 2013). It is protected by Israeli legislation through the Wildlife Protection Law (Ministry of Environmental Protection, 2010) but is not included in the Israeli Redlist (Shmida et al. 2011).

***Lemna minor* L.** The Lesser duckweed is a floating aquatic plant that consists of a small ovate frond, performing as both leaf and stem, and several daughter clones. *L. minor* is a member of Araceae (although once considered *Lemnaceae*), making it one of the smallest flowering plants. However, flower and seed production are rare, its reproduction being primarily vegetative. It can reproduce quickly under favorable conditions, creating colonies of genetically identical daughter fronds (Hillman 1961). *L. minor* is a fairly cosmopolitan species, native to Africa, Eurasia, and North America and naturalized in Australasia (Zhuang 2016). It is found in the Mediterranean region, including the West Bank, where it is uncommon (Danin 2004, Zohary 1966). In historic Palestine, *L. minor* is most common in coastal and northern areas, which tend to be more humid (Danin, 2004). It can be found in most types of freshwater environments especially those that are stagnant or slow-moving (Hillman 1961, Zhuang 2016, Zohary 1966). It may also grow in polluted water, where it can accumulate metals and other chemicals, and where it may be used for bioremediation (Hillman & Culley 1978, Kwan & Smith 1991). Due to its wide global distribution, *L. minor* is considered of Least Concern by the IUCN (Zhuang, 2016). *L. minor* has a hydrochorous dispersal mechanism, but may also be dispersed by birds, either via endzoochory when the birds eat and excrete the seeds or via ectozoochory when the plant thalli stick to the feet and feathers of the birds (Darwin 1861, Lovas-Kiss et al. 2018). Because it often relies on zoochory to colonize an ephemeral water body, the presence of the *L. minor* may vary from year to year (Lovas-Kiss et al. 2018). *L. minor* is a part of the diet of a broad range of organisms, from insects, to crustaceans, to anurans (including tadpoles of *Pelobates*), and may even be fed to livestock or eaten by humans (Hillman & Culley 1978).

Fig. 11. Pond Water-crowfoot, *Ranunculus peltatus.* in Jinsafut pond (24 Feb. 2018)

FAUNA: The pool fauna started to emerge in January and by 9 February, we recorded an adult tree frog (*Hyla*) as well as one tadpole possibly of *Hyla*. At that date, crustaceans were common (Fig. 12). During our visits we noted Agama lizards, a whip snake nearby, spiny mice, and many bird species visiting the pool or flying in the vicinity (cattle egrets, pigeons, doves, bulbuls, bee eaters, kestrels, house sparrows, crested larks, finches). Locals report wild boars using the pool and having mud baths in it at night. Tadpoles of *P. syriacus* were observed on 2 March 2018. Since this was the target species for this study (already extinct in Jordan and found only in this pool in the West Bank, Salman et al., 2014), we will detail more on this species below.

Fig. 12. Crustacean from Jinsafut pond.

***Pelobates syriacus (*Boettger, 1889)** Syrian Spadefoot Toad

Distribution: *Pelobates syriacus* is found in Armenia, Azerbaijan, Bulgaria, Georgia, Serbia, Italy, Albania, Romania, Russia, Turkey, Greece, Syria, Lebanon, Palestine, Iran, and Iraq (Bar and Haimovitch 2011, Blain et al., 2016, Szabolcs and Mizsei 2017). It is found in the northern part of Palestine in the upper Galilee and along the Mediterranean coast on the border of north Gaza (Degani 2013, Goldberg et al. 2009, Munwes et al. 2010), and in the middle of Palestine in Jinsafut pond (Salman et al. 2014).

Biology of the species: This species of toad is limited in distribution to the unique kind of temporary ponds with characteristic fauna and flora (Bar and Haimovitch, 2011). Adults feed on land arthropods and snails (Bar and Haimovitch, 2011). Tadpoles feed on vegetation like the leaves of duckweed and green stems of *Ranunculus* (from our observations). Toads lay their eggs in early to late February and the tadpoles develop amazingly fast so that in 8-10 weeks they metamorphose. The more remarkable is the appetite and fast weight gain of the tadpoles. Tadpoles of *P. syriacus* were seen and collected on 2 March 2018 at which time they had measured <10 mm in length (see Fig. 12). At that date, crustaceans were common. We reared tadpoles of this species from March 2nd in parallel with tadpoles of *Bufo virides*. The latter length grew about 2-3 fold over two months while the former grew some 10 fold in length over a similar period (see Figs. 13- 16). Similar observations were made by Degani (1982) who reported even more dramatic changes in weight of tadpoles with larva growing from some 80 fold in weight over 10 weeks. We did notice that one of the five tadpoles of equal size when collected as hatchlings metamorphosed almost three weeks after the other four (delayed development) even though they were raised under similar conditions. After metamorphosis, the unique burrowing capability of this toad is critical for its survival when their habitats are dehydrated some 8 months of the year (Degani and Carmali 1988, Székely et al. 2010). Syrian spadefoot toads thus spend much of the year deep under the ground (Goldberg et al. 2009).

Fig. 13. Early hatchling of tadpole of *Pelobates* syriacus collected on 2 March 2018. Length about 10 mm.

Fig. 14. Tadpole five weeks old (11 April 2018) with length about 55 mm.

Fig. 15. Tadpole six weeks old with beginning of hind limbs (23 April 2018). Length about 62 mm.

Fig. 16. Metamorphosed at nine weeks (11 May 2018)

Fig. 17. Released and immediately started digging (19 May 2018)

Conservation Status: According to the IUCN red list this species is least concern globally (Agasyan et al., 2009). However, the Syrian spadefoot toad is critically endangered locally (Dolev et al., 2004; Salman et al., 2014). It was reported in one rain fall pond in north Jordan from 1980-1983 but has since disappeared (Disi, 2002; Disi and Amr, 2010) due to human destruction of its habitat (Prof. Qumsiyeh and Prof. Amr visited the site more than once to verify this, see also Salman et al., 2014). The declining populations may relate to environmental changes around the world (Eggert et al. 2006) and is accompanied by declining genetic variation (Degani 2013).

4. SWOT Analysis

4.1. Strength

1- Uskar temporary rainfall pond in Jinsafut has a unique ecosystem that we have not seen in any other part of the West Bank yet including the presence of the Syrian spadefoot toad, *Pelobates syriacus* and the Pond Water-crowfoot, *Ranunculus peltatus* as well as invertebrates like crustaceans. These species are no longer found in Jordan and thus the pond provides a last remaining refuge in our area of the West Bank. Such ecosystems are of prime importance and are threatened around the Mediterranean region (Zacharias and Zamparas 2010; Hill et al. 2016)

2- Locals of the area showed interest and appreciation of this and want to protect it from destruction (by Israeli and local activities). Educational elements done in such systems did show a difference here in attitudes of local people as was reported in other countries (e.g. Sousa et al. 2016).

4.2. Weakness

1- We extensively surveyed the area all over the hills and valleys nearby and asked around in different areas and could not find another pool with the species described herein. While the temporary pond to the east of Deir Ballour have other crustaceans, the pool lacks the same plant species and lacks *Pelobates*. This makes the pond at Jinsafut unique and highly vulnerable.

2- The pond was mismanaged with it being used for watering livestock, human trampling and littering, and increased presence of wild boars.

4.3. Opportunity

1- There are great opportunities for protection. With simple remedies, this pool can be protected (see recommendations below). A meeting of people interested in Mediterranean temporary pond protection showed not only risks but great opportunities (see Bagalla et al. 2016).

2- Ecotourism's could be applied in the area for the rare species found which could increase the income for the village. The kind of ecotourism we are thinking about is controlled trips to the protected valley itself that appreciates while rtects fauna and flora and that culminate in a visit to the pond in Jinsafut and perhaps dinner and shopping that serves locals in existing or new facilities in the villages of Jinsafut and Al-Funduq.

3- We were able to raise tadpoles *ex situ* protecting them from predation and return mature toads to the environment successfully.
4- Our current study was mostly qualitative. Many species of fauna and flora found in the pond could provide significant research material for students at local universities and especially getting more quantitative data that allows us to look at changes in the coming years.

4.4. Threats

1- Sheep from the village and surrounding area comes to drink from the pond which affected the water amount in the pond and the vegetation around it. More than 650 individual sheep were observed using the pond by the PMNH team in one hour (9.2.2018, Fig. 18).
2- In 2017 a major digging near the pond for water pipeline connection could cause water leakage and dry the pond.
3- Israeli plans to build a road system connecting settlements with each other on the land where the pond is located would mean the end of the pond ecosystem.
4- There is increased traffic in the streets nearby (the Wadi Qana to Funduk and the route 55 from Qalqilia to Nablus). Cars increased because of increased population both of the native Palestinians and of the Jewish settlers.
5- Solid waste that is dumped in the pond could affect the life of the species that depend on this water source (Fig. 19).

Fig. 18. Sheep come to drink from the pond.

Fig. 19. Solid wastes in the Jinsafut pond.

5. Educational components of Project

The project started with an opening ceremony and educational workshop for the community that allowed us to not only give the locals an idea of the project but also to seek their input and feedback and suggestions (this is community buy-in). For an (Arabic) report of that meeting, see Appendix. At every stage these stakeholders were involved including the local administrative councils, local villagers, and local and national Environmental Quality Authority officials. The involvement took the shape of conbsulting on the project, getting ideas, networking us with other people. At the end of the project a sign was erected at the site and a workshop held to present the full results and seek final input on recommendations (see below). Long term monitoring was agreed to be a collaborative effort between the local authorities (governeor's office and village councils) and the Palestine Museum of Natural History. The first season of monitoring will be spring 2019.

Fig 21. Sign erected at the pool

Fig 22. Closing ceremony

Fig 23. Closing ceremony and workshop. Presentation of results by Elias Handal

Fig 24. Site visit by local and national officials

6. Recommendations and Management Plan

The recommendations and management plan below is a briefing based on a) the result of the scientific (technical) study summarized above, b) workshops held with local and national officials and concerned stakeholders, c) individual meetings with key knowledgeable people and feedback from other scientists (e.g. Prof. Zuhair Amr, Jordan University of Science and Technology, Irbid, Jordan), d) the concomitant SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis listed above (section 4). They were agreed to in the final workshop and this report will form the basis of long-term monitoring and evaluation by local authorities under supervision of the Environmental Quality Authority.

1) The local and national Palestinian interest in this site as a critical buffer zone and unique ecosystem at the northern side of Wadi Qana Protected Area (WQPA) must be maintained by occasional meetings, visitation, and communication from EQA and from the study team.

2) Local village councils will work to further educate the community about the value of this site (now we installed a sign that helps) and especially focus on potentially damaging use and abuse of the pond. In particular, eliminate solid waste disposal at or near the site and reduce and eventually eliminate the use of the pond for watering livestock. An alternative water source for livestock can be created locally in a fairly inexpensive way.

3) The governorate and the local community with cooperation of the EQA and the Ministry of Agriculture will add a bit of soil and plant a row of Rosemary and a few native trees (carob, oak, hawthorn were chosen because they are found in the hills nearby, are acclimatized to local climate and would be aesthetically beautiful) as shown in Figure 25 (three sides of the pond). This helps to a) reduce downhill erosion (holding soil), b) reduce wind evaporative power on the pond, c) create a natural barrier around the pond that reduces accessibility to the actual pool from people and livestock while maintaining and actually enhancing its aesthetic value.

Fig. 25. Plan for a natural bush/tree line around the pond

4) Encourage further scientific research on this ecosystem and continue to search for similar ecosystems in the West Bank especially more quantitative biodiversity indicators that can be measured repeatedly in coming years. Also (pending agreement with the land owner) consider the possibility of rehabilitating a pond that was covered as part of human development in a nearby village. If allowing it to refill with water will not bring up the native fauna back, it can be restocked from the pool in Jinsafut.

5) Considering our successful experiment of raising tadpoles *ex situ* and returning them to the pond, we recommend this is done for a few tadpoles every year so as to keep population level higher (reduces predation by birds).

6) Do a larger study for Wadi Qana Protected area and all its buffer zones (especially south, east, and west which have yet to be studied) and create a proper management plan for the whole area which is a responsibility f the Environmental Quality Authority (but can be sub-contracted to experts).

7) After the above are accomplished and subject to further studies and better management estimated to be in 2-3 years, being promoting LOCAL ecotourism and very limited outside ecotourism to visit WQPA and buffer zones near it like this Usqur pool near Jinsafut.

Acknowledgments

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Appendix: Report on one of the workshops held 24 Feb 2018 (in Arabic)

تقرير ورشة العمل في جينصافوط

مكان الورشة: قاعة المجلس الاول للخدمات المشتركة (جورة عمرة)

تاريخ الورشة: 24.2.2018

اجندة الورشة:-

1. تعريف بموضوع واهداف الورشة
2. تعريف بموقع فلسطين واهميته الجغرافية
3. تعريف بمفهوم التنوع الحيوي بشكل عام ووضع التنوع الحيوي في فلسطين بشكل خاص
4. تعريف باهمية بركة جين صافوط وهدف دراستها بالاضافة الى اهمية الضفدع الموجود فيها
5. نقاش للاجابة على التساؤلات و جمع معلومات حول البركة

تم بتاريخ 24.2.2018 عمل ورشة عمل في قاعة المجلس الاول للخدمات المشتركة (جورة عمرة) في قرية الفندق حيث تم توجيه دعوة لاهالي قرية جين صافوط وقرية الفندق بالاضافة الى المؤسسات والهيئات العاملة في القريتين المستهدفتين. تم خلال الورشة تعريف الحضور بموضوع واهداف الورشة بالاضافة الى التعريف بموقع فلسطين واهميته الجغرافية في زيادة التنوع الحيوي. كما تم خلال الورشة تعريف الحضور باهمية البركة الموجودة على مدخل قرية جينصافوط واهمية الضفدع الموجود فيها من ناحية بيئية والخطر الذي يواجهه بالاضافة الى عمل نقاش مفتوح تم خلاله جمع معلومات من السكان المحليين حول البركة والموقع.

نتائج الورشة:

1. الربط ما بين فريق المتحف و المؤسسات والهيئات العاملة في القرى المحيطة بمنطقة الدراسة
2. توعية المجتمع حول الاهمية البيئية والوطنية للبركة
3. جمع معلومات من السكان المحليين والمؤسسات حول البركة ومنطقة الدراسة

المعلومات التي تم جمعها عن المنطقة من السكان المحليين والهيئات المحلية العاملة في القرية:

- يطلق على البركة اسم بركة (عُسكر)
- منطقة البركة هي املاك عامة
- من المقرر وجود مشروع لتحويل اتجاه سير المستوطنين من داخل قرية الفندق ليلتف الشارع من خارج قرية الفندق ويرتبط بالطريق الواصل بين قرية اماتين والشارع الرئيسي، وبناء على اقوال رؤساء البلديات وسكان المنطقة سيتم طمر البركة وعمل دوار فوق البركة بالاضافة الى عمل توسعة للشارع ليكون على 4 مسارب
- تتبع قرية جين صافوط وقرية الفندق الى مجلس مشترك يسمى المجلس الاول للخدمات المشتركة (جورة عمرة) يضم قرى جين صافوط، الفندق، حجة، اماتين وفرعتا، باقة الحطب، جيت، كفر قدوم وكفر لاقف، ويقوم عمل المجلس المشترك على تنظيم المشاريع المخطط لها في منطقة جورة عمرة والتنسيق بين المؤسسات ذات العلاقة حول الموضوع
- سجل وجود برك سابقة في المنطقة ولكن تم ردمها لصالح التوسع العمراني و الحد من تجمع مياه الامطار فيها لصالح الاستخدام كاراضي زراعية
- تحتوي البركة على الماء حتى منتصف شهر 6 بناء على الموسم المطري وكلما قلت نسبة الامطار كلما قصرت فترة بقاء الماء في البركة
- عندما يصل الماء في البركة الى ارتفاع الشارع الترابي الموجود بجانبها تبدا المياه بالفيضان ويتوقف تجميع البركة للمياه
- الحفر الذي حصل في المنطقة قبل ما يقارب عام ونصف قامت به شركة ماكاروت بسبب وجود خط ماء رئيسي للشركة يمتد اسفل البركة من مستوطنة عامونيئيل وقد قامت الشركة بفتح الخط للتاكد من عدم تسريبه للمياه الى البركة ومن ثم قاموا باعادة وضع التربة خط المياه
- يقوم رعاة الاغنام بتوريد الاغنام على البركة صباحا قبل الاتجاه نحو المراعي بالاضافة الى توريد الاغنام مساء بعد العودة من المراعي لري الاغنام
- سجل بتاريخ 9.2.2018 في جولة ميدانية الى البركة توريد اكثر من 650 راس اغنام خلال ساعة واحدة على البركة
- اطلق على البركة اسم بركة عُسكر نسبة الى بلدة قديمة تدعى عُسكر كانت موجودة بالقرب من البركة
- بناء على اقوال السكان المحليين فان للبركة قيمة ثقافية اذ ان اهالي المناطق المجاورة ياخذون كمية قليلة من تربة البركة ويضعوها في البيوت او في الاساسات خلال البناء كمحرز للحفاظ على البيت وصونه وزيادة بركته بالاضافة الى اخذ عينات كمحرز لحفظ الاطفال وصونهم وزيادة بركتهم
- يمكن ايجاد المخطط المكاني المقترح للشارع على موقع (geomolg.ps) والبحث عن اماتين/ جينصافوط --> Layers
- المجلس المشترك على استعداد لتوفير وايجاد منامات للفريق خلال العمل الليلي
- البركة ممتلئة الى اقصى حد واي مياه اخرى تدخل الى البركة تفيض على الشارع المحاذي للبركة ويتم فقدها (24.2.2018)
- المجلس المشترك على استعداد لتقديم كل ما يلزم من اضافة مياه وحماية للبركة بناء على توجيهات المتحف