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Chapter 29
Amphibians of Egypt: a troubled resource

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Amphibians in Egypt are represented by only nine species. Some species (*Amietophrynus regularis*, *Bufotes boulengeri*, *Ptychadena mascareniensis*, and *Pelophylax bedriagae*) are well-known and common. Distributions of *Duttaphrynus dodsoni* and *Hyla savignyi* are limited, *Amietophrynus kassasii* is common and restricted while *Ptychadena schillukorum* appears uncommon and localized. Egyptian amphibians are, in part, poorly studied; some are threatened, others have declined or disappeared at various localities. Over-harvesting, habitat destruction, predation, overuse of pesticides, and road-kills are main causes of population decline. In 2010 the Egyptian government issued a resolution prohibiting exportation of *Pelophylax bedriagae* taken from natural habitats for three years – at least – to allow rehabilitation of populations; the local CITES committee had previously issued a similar declaration in 2009. Limitation of quantities of *Amietophrynus regularis* used for dissection in Egyptian universities and scientific agencies was also requested by the Secretary of the Egyptian Environment. These decrees and declarations seem to have been successful during the past few years.

Key words: Amphibia; conservation; Egypt; population decline.

Los anfibios de Egipto: un recurso en problemas. Los anfibios en Egipto están representados únicamente por nueve especies. Algunas especies (*Amietophrynus regularis*, *Bufotes boulengeri*, *Ptychadena mascareniensis* y *Pelophylax bedriagae*) son bien conocidas y comunes. Las distribuciones de *Duttaphrynus dodsoni* e *Hyla savignyi* son limitadas, *Amietophrynus kassasii* es común y restricta mientras que *Ptychadena schillukorum* es poco común y también restricta. Los anfibios egipcios están, en parte, poco estudiados, algunos están amenazados, mientras que otros están en declive o han desaparecido en varias localidades. La sobreexplotación, destrucción de hábitat, depredación, excesivo uso de pesticidas y los atropellos son las principales causas del declive de las poblaciones. En 2010, el gobierno egipcio emitió una resolución prohibiendo la exportación de *Pelophylax bedriagae* capturadas en sus hábitats naturales durante tres años – por lo menos – para permitir la recuperación de las poblaciones; previamente el comité CITES local había emitido una declaración similar en 2009. Asimismo, la secretaría de ambiente de Egipto solicitó la restricción de las cantidades de *Amietophrynus regularis* utilizadas para disección en universidades egipcias y agencias científicas. Estos decretos y declaraciones parecen haber tenido éxito a lo largo de los últimos años.

Key words: Amphibia; conservación; declive de poblaciones; Egipto.

Most of Egypt is desert, and frogs inhabiting Egypt must share water resources with humans. Populations, both of humans and anurans, are concentrated along the River Nile Valley and Delta (which together represent less than 5% of Egypt's total area) and most anuran species are threatened. The paucity of suitable frog habitat, coupled with the need for cohabitation with humans, may ultimately lead to the extinction of one or more species in many places in Egypt.

Egypt has a small (nine species), poorly-studied, amphibian fauna whose current status and need for conservation are not well known. Four species (*Amietophrynus regularis*, *Bufotes boulengeri*, *Ptychadena mascareniensis*, and *Pelophylax*

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bedriagae) are considered relatively widespread and common, and three (*Pelophylax saharicus* in the west at Siwa Oasis [Fig. 1, site 2], *Duttaphrynus dodsoni* in the extreme southeast at Jabal Elba [Fig. 1, site 26], and *Hyla savignyi* in the extreme northeast of the Sinai Peninsula) are restricted to small areas. *Amietophrynus kassasii* is common and restricted, while *Ptychadena schillukorum* appears rare and localized (BAHA EL DIN, 2006). The goal of this contribution is to assess potential threats, current status, and distribution of Egyptian amphibians in order to recommend conservation management strategies.

THE FAUNA

The taxonomy for this study follows Frost (2013).

Amietophrynus kassasii (Baha El Din, 1993). Local name: Dofda'a Qassas.

Nile Valley Toads, previously identified as *Bufo vittatus* in Egypt (ANDRE 1909; FLOWER 1933), occur in the Nile Valley and Delta and in the Fayoum (Fig. 1, site 20) Depression. SABER (2002) reported dense populations in bodies of freshwater south of Lake Burullus (Fig. 1, site 5). BAHA EL DIN (2006) suggested this species was common but localized and assumed it spread northward along reed swamps on both banks of the River Nile and its branching channels after construction of the Aswan Dam in the extreme south. It is recorded upstream as far as Luxor (Fig. 1, site 23).

Amietophrynus kassasii is mostly aquatic and is found in densely vegetated shallow or deep water, reed swamps, rice fields, overgrown canals, and water ways. It is seen only occasionally on land (BAHA EL DIN, 2006).

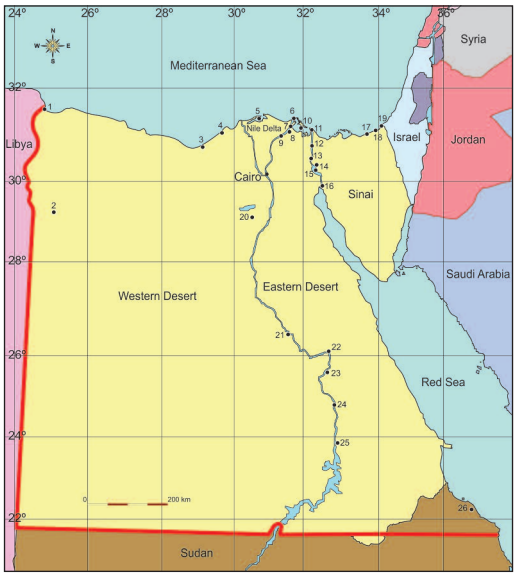

Figure 1: Map of Egypt and sites referred in the text. 1: As-Salloum; 2: Siwa Oasis; 3: Burg Al-Arab; 4: Alexandria; 5: Lake Burullus; 6: Ras El Barr; 7: Dumyat; 8: Faraskur; 9: Shirbin; 10: Lake Manzala; 11: Port Saïd; 12: Al-Qantara; 13: Ismailia; 14: Meet Abul Koum Al Jadidah; 15: Bitter Lakes; 16: Suez; 17: Al-Arish; 18: Sheikh Zowayid; 19: Rafah; 20: Fayoum; 21: Suhag; 22: Qena; 23: Luxor; 24: Edfu; 25: Aswan; 26: Jabal Elba.

Amietophrynus regularis (Reuss, 1833). Local name: Ad-Dofda'a Al-Masreyya Ar-Raqta'a.

Egyptian Toads are very common around creeks, ponds, farms, and houses. They are found in the Nile Delta (especially Ash-Sharqeyya, Ad-Daqahleyya, Al-Gharbeyya, Al-Qalubeyya, and Kafr Ash-Sheikh Governorates); the Nile Valley from upstream of Dumyat (Fig. 1, site 7) down to Abu Simbel south of Aswan City (Fig. 1, site 25); in Fayoum (Fig. 1, site 20); along the northwestern coast from Alexandria (Fig. 1, site 4) westward to As-Salloum (Fig. 1, site 1) near the border with Libya (ANDERSON, 1898; FLOWER, 1933; MARX, 1968;

MICHAEL *et al.*, 1992; BAHA EL DIN, 2006); at Lake Burullus (Fig. 1, site 5) (SABER, 2002); in newly-reclaimed areas in the western coastal desert (SALEH, 1997) and in Western Desert oases (BAHA EL DIN, 2006); the Suez Canal Zone, and recently in Sinai 20 km west of Al-Arish (Fig. 1, site 17) (IBRAHIM, 2001a).

Very common around freshwater irrigation canals on the west bank of the Suez Canal from Port Saïd (Fig. 1, site 11) to Suez (Fig. 1, site 16), this toad is often heard calling in gardens and around houses. Following introduction of water from the River Nile it has also become widespread on the east bank of the Suez Canal, especially in green fields east of the Bitter Lakes (Fig. 1, site 15) that extend up to ten km into Sinai (IBRAHIM, 2013).

Bufotes boulengeri (Lataste, 1879). Local name: Dofda'a Khadra.

The Green Toad occurs mainly in northern Egypt, but is infrequently found from Rafah (Fig. 1, site 19) at the northeastern extremity of the country to As-Salloum (Fig. 1, site 1) in the extreme west (BAHA EL DIN, 2006). It has been recorded from Lake Burullus (Fig. 1, site 5); Fayoum (Fig. 1, site 20); Alexandria and its environs (Fig. 1, site 4); Burg Al-Arab (Fig. 1, site 3); and Western Desert oases (FLOWER, 1933; MARX, 1968; MICHAEL *et al.*, 1992; SALEH, 1997; SABER, 2002: Annex 6). MARX (1968) reported it from Al-Qantara (Fig. 1, site 12) and Anderson (1898) reported finding this species in Luxor, but there has been no record of this species in Upper Egypt since his report.

SALEH (1997) recorded this species from the Suez Canal zone but did not cite an exact locality; occurrence in the Suez Canal Zone is doubtful. The only taxon of the family Bufonidae present on both sides of the Suez Canal is *A. regularis* (IBRAHIM, 2013), and *A. regularis* is not known to occur in sympatry with *B. boulengeri* (BAHA EL DIN, 2006). The local record from Shirbin (Fig. 1, site 9) in the Nile Delta (MARX, 1968) is also incorrect; this town has been visited many times since, and no green toads were found. *Amietophrynus regularis*, along with *Ptychadena mascareniensis*, is, however, found there (personal observation).

In North Sinai, *B. boulengeri* is common, and found in small bodies of water, ponds, and irrigating freshwater creeks in Al-Arish (Fig. 1, site 17), Sheikh Zowayid (Fig. 1, site 18), Rafah, and Sad Ar-Rawafa'a (HART, 1891; SCHMIDT & MARX, 1956; WERNER, 1982; GHOBASHI *et al.*, 1990).

Duttaphrynus dodsoni Boulenger, 1895. Local name: Dofda'a Elba.

Dodson's Toad was first reported from Jabal (Mount) Elba (Fig. 1, site 26) at the extreme southeastern corner of Egypt (SCHMIDT & MARX, 1957). It is considered to be confined to this area, but southern Egypt has not been thoroughly surveyed and this toad may be found west of Jabal Elba at the Sudanese border. BAHA EL DIN (2006) observed that toads often perch in high positions on rocks and small boulders while looking for moving prey underneath. He also suggested that during long-lasting droughts they probably move to higher elevations where there is higher humidity, and that they can be found during winter and spring in or near wells at night.

Hyla savignyi Audouin, 1827. Local name: Dofda'a Ash-shajar.

I discovered Savigny's Treefrog in Egypt for the first time in 1992 (BAHA EL DIN, 1994). This species was confined to local farms, especially those near the beach, in Rafah (Fig. 1, site 19) at the Egypt-Israel border and in Sheikh Zowayid (Fig. 1, site 18) where Savigny's Treefrogs were usually seen on trees on both banks of man-made canals (locally known as Thameela), and occasionally on the ground near shallow bodies of water.

The treefrog in northern Sinai is confined to an area not extending more than 20 km west of Rafah. Treefrogs are not found among peach (*Prunus persica*), almond (*Amygdalis communis*) or grape (*Vitis vinifera*) crops in Rafah (personal observation) because these crops depend upon rainwater which is relatively scant. Recently, however, a large number of drip-system-irrigated farms and orchards has been established from Rafah up to 10 km south and west of the city. While areas of pipe leakage and small man-made irrigation pools of varying size provide limited water resources for treefrogs, populations are large enough that local people are irritated by the noise made by calling frogs. Vocalizations increased in some areas and decreased in others as I drove southwest of Rafah; frogs were numerous in mandarin (*Citrus* x *nobilis*) orchards which represent almost 80% of these farms, and less numerous in olive (*Olea europaea*) and apple (*Pyrus malus*) orchards; olives and apples do not require as much water as mandarins.

I visited the agricultural project at Al-Kharrouba, about 15 km east of Al-Arish City (Fig. 1, site 17) in June 2009, and no treefrogs were seen despite the presence of water and dense vegetation around both banks of the 450-m man-made canal. The canal depends upon a pump station which has been unused and neglected for a relatively long time, and salinity in the creek has increased to the point that it is no longer suitable for the frogs. While it has been assumed this frog might be found in Al-Arish (BAHA EL DIN, 2006), the Al-Kharrouba area apparently acts as a barrier to treefrog distribution as extensive surveys from Al-Kharrouba westward to Al-Arish did not produce this species.

Destruction of habitat and urbanization, especially at the beach, do not allow this species to spread west of Sheikh Zowayid. An adult treefrog captured from the village of Ar-Roudha, 50 km west of Al-Arish, is deposited in the herpetological collection of Zaranik protectorate. The collector assured me the specimen was captured in the village, but the treefrog, which may have been introduced to the area, no longer occurs there.

Pelophylax bedriagae (Camerano, 1882). Local name: Gazza'a Akhdar.

Currently recorded from the Nile Valley and Delta, extreme northeast Sinai, Fayoum (Fig. 1, site 20) and Luxor (Fig. 1, site 23) (BAHA EL DIN, 2006), the Levant Green Frog was first recorded from Egypt when specimens were found in Giza by MARX (1968). BAHA EL DIN (2006) suggested that successive ecological changes downstream from the high Aswan Dam may be related to the occurrence of *P. bedriagae* in Upper Egypt. It is a common species at Lake Burullus (Fig. 1, site 5) (SABER, 2002: Annex 6).

This species was collected for the first time from Rafah (Fig. 1, site 19), North Sinai in 1987 (IBRAHIM, 2011). In Sinai, however,

P. bedriagae is currently on the verge of extirpation. Once abundantly distributed in Rafah and Sheikh Zowayid (Fig. 1, site 18) in the peninsula's extreme northeast, it is now rarely observed, even during the breeding season (personal observation).

Levant Green Frogs were first observed in the Suez Canal Zone six km northwest of Ismailia (Fig. 1, site 13), and a large number were heard vocalizing in natural swamps about three km southwest of Serapeum village during June, 2008. According to local people, these swamps were not present 30 years ago. On the east bank of the Suez Canal, *P. bedriagae* were first recorded from a dense reed assemblage in a small swamp five km north of Ismailia East at Attaqaddom village (IBRAHIM, 2011). No additional east-bank localities for the species were listed (IBRAHIM, 2013).

This species is highly resistant to environmental pollution. In Ismailia Governorate, it has been found in a heavily littered swamp polluted by organic waste (Fig. 2). Some ponds considered the main source of mosquito proliferation in Ferdan (about 10 km north of Ismailia City) have been filled in recently. Disappearance of ponds and urbanization of Ferdan may have caused this frog's decline.

Pelophylax saharicus (Boulenger, 1913). Local name: Gazza'a Sahrawy.

The Saharan Frog appears confined to the Siwa Oasis in the Western Desert (Fig. 1, site 2) (BAHA EL DIN, 2006). It is expected, however, that its range might extend further to the west, possibly to the Egypt-Libya border. It is a common frog; some individuals were captured from Siwa for identification and released at the site of capture during summer, 2007.

Ptychadena mascareniensis (Duméril and Bibron, 1841). Local name: Gazza'a Mukhattat.

The Mascarene Ridged Frog (*P. m. mascareniensis*) is widespread throughout the Nile Valley and Delta. Dense populations are found in almost all Nile Delta Governorates, especially Dumyat, Ad-Daqahleyya, Al-Gharbeyya, Ash-Sharqeyya, Al-Menufeyya, and Al-Beheira. It is common in Lake Burullus (Fig. 1, site 5) (SABER, 2002: Annex 6) and regularly observed in the small canals irrigating cultivated fields (especially rice). It has spread upstream to Qena (Fig. 1, site 22), Edfu (Fig. 1, site 24), and Fayoum (Fig. 1, site 20) (ANDERSON, 1898; FLOWER, 1933; MARX, 1968) and has been recorded in reclaimed desert areas irrigated with Nile water (SALEH, 1997). This species is also well-known on the west bank of the Suez Canal around Port Saïd (Fig. 1, site 11) and at Ferdan and Al-Qantara West (Fig. 1, site 12) in Ismailia Governorate, extending southwest to near Suez (Fig. 1, site 16) (IBRAHIM, 2013).

For the first time in Sinai, specimens (one each) were recorded on local farms 17 km south of Al-Arish (Fig. 1, site 17), and

Figure 2: A view of a polluted natural swamp south of Ismailia.

from Sheikh Zowayid (Fig. 1, site 18). It has been suggested that these animals may have reached these areas accidentally via local transport carrying fodder and other commodities (IBRAHIM, 2001b). On the east bank of the Suez Canal this species has become common by following streams to recently cultivated lands east of Bitter Lakes (Fig. 1, site 15). Several frogs were observed and heard vocalizing in a pool alongside *A. regularis* at Meet Abul Koum Al Jadidah (Fig. 1, site 14) about seven km east of the Suez Canal (IBRAHIM, 2013). The local record of this species from Wadi Feiran, South Sinai, by SCHMIDT & MARX (1956) is likely to be erroneous and unreliable because this area is extremely arid and represents unsuitable habitat for the species.

Ptychadena schillukorum (Werner, 1908). Local name: Gazza'a Sudani.

BAHA EL DIN (2005) reported the occurrence of the Schilluk Ridged Frog in Egypt based on two individuals, one from the western margin of Lake Manzala (Fig. 1, site 10) and the other from Fayoum (Fig. 1, site 20). He provided an account for the Egyptian Nile Delta population and discussed confusion with *P. mascareniensis*. I visited the western area of Lake Manzala but could not locate this species. In Dumyat (Fig. 1, site 7), Ras El Barr area (Fig. 1, site 6), and Faraskur (Fig. 1, site 8) only three amphibian species are known, *A. regularis*, *P. mascareniensis*, and *P. bedriagae* (Gamal Abdulla, personal communication). Intensive search is needed to locate this species in view of the fact that it is localized to small areas and not well-known in Egypt (BAHA EL DIN, 2006).

THREATS, DECLINE AND CONSERVATION

Ancient Egyptians have records of "the frog", finding it in shallow bodies of water around the River Nile. Toads, according to records from the Pharaohs, were so abundant that they were called "Khefen" (one hundred thousand) and the ancient Egyptians painted images of toads on the walls of temples and considered toads to be sacred. It is possible that, because of these images and a highly-visible productivity, the frog became a powerful symbol of self proliferation and regeneration of life.

The croaking of toads has always been a familiar sound to Egyptians. Two decades ago, toads were seen throughout the length of the River Nile and its Delta. Choruses were heard wherever a source of water was found, much to the annoyance of the people living nearby. Recently, however, decrease in population numbers has become evident even to the public, and the sound has become less intensive than before. The reasons for declining amphibian populations in Egypt can be summarized as follows:

Over-harvesting

One of the major threats confronting *A. regularis* and *P. bedriagae* is annual harvesting for teaching, research, and exportation. Up to two million *A. regularis* are taken from the wild each year to meet the needs of Egyptian universities and scientific research centres. Unfortunately, this toad is still used for dissection and animal dealers collect both adult and young toads; many toads, especially juveniles, die from poor handling and storage. Animal dealers who provide Egyptian universities with toads emphasized that there is a remarkable decline in

amphibian populations, and in *A. regularis* in particular (personal observation). It is currently difficult to meet the needs of all universities and research agencies. Rashed Refaee, an animal dealer supplying Cairo University, stated that ten years ago he used to collect 1000 frogs in one hour; today four people now spend four days to collect 140 individuals. That dealer was supplying the University with approximately 250,000 toads per year collected over a nine-month period that included the mating season.

A large number of Levant Green Frogs, *P. bedriagae*, is exported each year to countries where it is used for food. These frogs were removed from the wild, mostly from Lake Manzala and Lake Burullus (Fig. 1, sites 10 and 5, respectively), but substantial quantities were also collected from Nile creeks, and from irrigating canals in Upper Egypt (Suhag, Qena [Fig. 1, sites 21 and 22, respectively]). Figure 3 clearly shows variation in quantities exported between 2000 and 2009, suggesting that frog numbers have likely declined due to over harvesting. No aquaculture for breeding frogs is known in Egypt, but there are man-made pools used for maintaining frogs until ready for export.

One frog dealer at Lake Manzala with whom I spoke emphasized that all sizes of frogs, including juveniles, are removed from the Lake between September and June; while hunters used to catch up to two metric tons of frogs from the Lake in one day during the breeding season, it is now difficult to catch two kilograms in one day. He also stated that breeding these frogs in captivity was once attempted, but the attempt failed because the frogs decreased in size and eventually died. Animal dealers in the Suez Canal Zone similarly collect a large number of frogs from natural habitats.

All anurans listed above are species of "Least Concern" according to the IUCN (STUART *et al.*, 2008), and none is locally threatened or endangered according to CITES. While these species may be classed as "Least Concern" on the scale of all of Egypt, many local populations are severely threatened through overexploitation or other anthropogenic effects (such

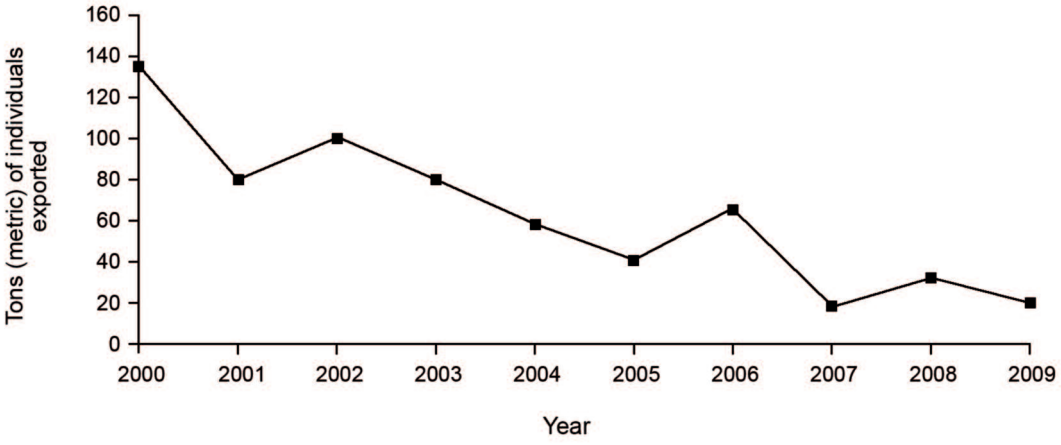

Figure 3: Estimate of the number of *Pelophylax bedriagae* individuals removed from natural habitats for exportation between 2000 and 2009 (data courtesy of Ragi Toma).

as filling in ponds). While no studies on amphibian conservation have evaluated the real danger and challenges these species face, the Egyptian Secretary of the Environment (2 February 2010) approved a decree prohibiting exportation of Levant Green Frogs (*P. bedriagae*) taken from natural habitats for a period of at least three years to allow the species to recover and reproduce. Only farm-raised frogs may be exploited after conclusion of the specified three-year period and if, after three years, hunting is allowed, it will not be permitted during the reproductive season (March to July). The local CITES committee had issued a similar decree on 15 October 2009.

In addition, the Secretary of the Environment has requested that the Secretary of Higher Education and Scientific Research evaluate reducing the quantity of Egyptian toads (*A. regularis*) used for dissection in Egyptian universities and scientific agencies.

Destruction of Habitat

Expansion of urbanization has caused severe degradation of amphibian habitats, especially at breeding sites. In the Nile Delta a vast area of green fields has been devastated because of human expansion at the expense of water sources that originally created breeding habitat for frogs. All anurans in the Delta are affected, particularly *A. regularis* and *P. mascareniensis*. The same situation is evident along the western portion of the Mediterranean coast, where extensive human expansion, road projects, and other anthropocentric use of land has occurred during the past few decades, and destruction of shallow bodies of fresh water has damaged habitat and caused extirpation of populations of frogs in many places.

The dramatic decline of *P. bedriagae* in northern Sinai can be attributed to habitat destruction due to change from furrow-irrigation to drip irrigation. Furrow-irrigation was based on the establishment of permanent underground sources (man-made canals) that allowed frogs to live and reproduce. These canals have been neglected and most have either dried up or become salty while others have been filled in. Since *P. bedriagae* is highly aquatic, it gradually disappeared, and *H. savignyi* is no longer observed in Rafah City for the same reason. No treefrogs were observed on farms near the beach or close to the border and, during summer 2009, very few individuals of *P. bedriagae* or *H. savignyi* were observed in an irrigating canal about 7 km south of Rafah or in a small canal at Sheikh Zowayid. Frogs in these canals are threatened as this habitat is expected to dry up because there is no more underground water feeding it. *Pelophylax bedriagae* is also threatened by localized loss of habitat through drainage of wetlands along the banks of the River Nile.

Predators

The invasive red swamp crayfish (*Procambarus clarkii*) was unwisely and irresponsibly introduced to the River Nile at Giza in 1983 and represents a serious threat to anurans (*A. regularis* in particular) within the river system. This New-World crayfish, free from natural predators in Egypt, has spread rapidly throughout the Nile Valley from Dumyat to Aswan and small numbers have been recently recorded in northern Sinai (IBRAHIM & KHALIL, 2009). While this crayfish feeds mainly on fishes, snails, and plants in its natural habitat, *P. clarkii* sub-

stantially reduced larval survival in all anuran species in a southwest Iberian population to which it had been introduced in 1973 (CRUZ & REBELO, 2005).

The obvious decline in frog populations coincident with widespread distribution of these crayfish suggests that this predator plays a key role in Egypt as well, but as yet there has been no direct evidence of predation recorded. One animal dealer with whom I spoke, however, stated that he had to travel to Upper Egypt to collect toads because (he believes) crayfish have greatly reduced toad populations in the Nile Delta. Crayfish are considerably less expensive than shrimp and red lobster and a great effort is being made to control this invasive animal by catching and selling large quantities to Egyptian and international markets, thus attempting to minimize its effect on fish and amphibians (Magdy Khalil, personal communication).

Tadpoles and frogs are also important food items for some snakes, such as the Diced Water Snake, *Natrix tessellata* (SALEH, 1997), and large lizards, such as the Nile Monitor, *Varanus niloticus* (LENZ, 2004), inhabiting Egyptian freshwater systems.

Overuse of Pesticides

Pesticides are used routinely and excessively. This excessive use has contributed substantially to contamination of the wetlands in which frogs breed, and may lead to extensive destruction of eggs and tadpoles. Puddles and swamps are normally sprayed with pesticides and petroleum hydrocarbons (e.g. kerosene and crude oil) to control mosquitoes and flies and, thus, anurans and their eggs are likely affected negatively.

Road-Kills

During spring and summer several dead anurans are seen on main highways and connecting roads passing through villages and green fields (personal observation).

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