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CONTRIBUTION TO THE MALACOFAUNA OF THE NORTH COAST OF EGYPT

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ABSTRACT: The survey of land snails of the North Coast of Egypt, still insufficiently known and not studied since the 1950s, is presented. The fauna of the region is relatively species-rich. Thirteen land snail species of four families are recorded: Helicidae (*Theba pisana* (O. F. Müller), *Eremina desertorum desertorum* (Forskål), *E. d. irregularis* (Férussac), *E. d. zitteli* Boettger, *Eobania vermiculata* (O. F. Müller), *Helix pronuba* Westerlund et Blanc), Geomitridae (*Xeropicta krynickii* (Krynicki), *Xerocrassa tuberculosa* (Conrad), *X. tanousi* (Westerlund), *Xerocrassa* sp., *Cochlicella acuta* (O. F. Müller)), Subulinidae (*Rumina saharica* Pallary) and Sphincterochilidae (*Sphincterochila* sp.). This paper is a preliminary review aimed at throwing some light on the malacofauna of the Mediterranean region in the context of the biodiversity studies in Egypt.

KEY WORDS: Egypt, Mediterranean Coast, land snails

INTRODUCTION

Most of Egypt is arid, yet some areas hold a diverse flora thus providing favourable habitats for animals, including molluscs. One of the earliest surveys of mollusc fauna in the Delta and Egyptian deserts, the area extending from Alexandria to near the Sudan Border, was done by MARTENS (1865). The region was then studied in the 1900s till the 1950s (PALLARY 1909, 1921, 1924, KALTENBACH 1934, 1942, BLUME 1952, BIGGS 1959). As a result, different land snails were listed from northern Egypt, i.e. Alexandria, Marsa Matrouh, Siwa and Sinai. Since then there was no land snail survey in the area.

The habitats concerned are open deserts exposed to great daily fluctuations of temperature. The snails shelter between rocks and bushes which grow in the cracks of the boulders and large masses of rock. In some seasons of the year water is provided by dew and heavy mists. This study is aimed at presenting preliminary data on the terrestrial gastropod fauna of the Mediterranean region based on several plots at the North Coast.

MATERIAL AND METHODS

FIELD STUDIES

The study area was chosen based on earlier publications (MARTENS 1865, PALLARY 1909, 1921, 1924, KALTENBACH 1934, 1942, BLUME 1952, BIGGS 1959) which listed different native terrestrial gastropods in northern Egypt. It included the Mediterranean Coast from Alexandria, a city extending for about 32 km along the coast of the Mediterranean sea in the north-central part of Egypt, starting with King Mariout and Borg El Arab, to El Sallum at the eastern border of Libya and ca. 145 km from Tobruk. It is one of the longest Mediterranean shores in North Africa: from King Mariout, Alexandria (31°01'46.60"N, 29°46'52.21"E) to El Sallum (31°29'07.66"N, 25°14'50.73"E) (see: Fig. 1 and Appendix 1). The desert environment is arid, with little precipitation and prevailing winds from the Mediterranean Sea, with sandy and limestone soil.

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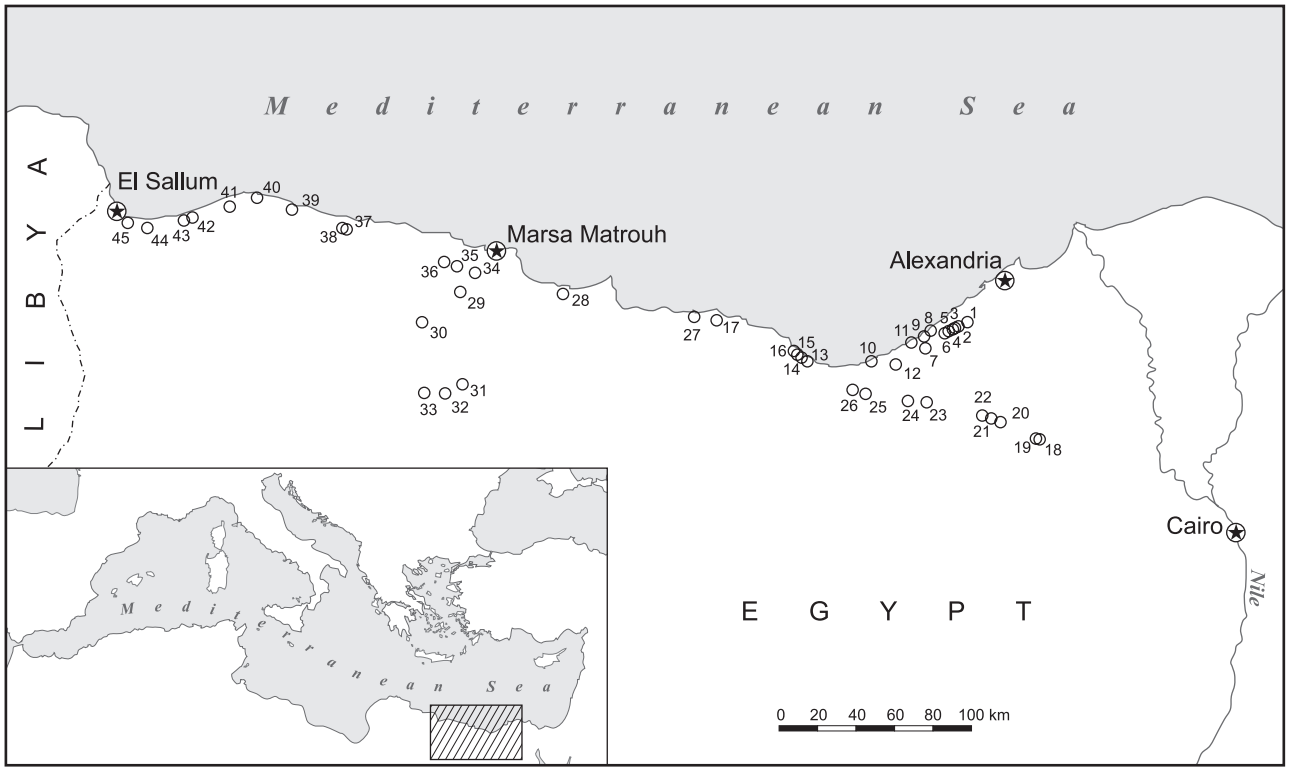

Fig. 1. Map of Egypt showing collecting plots (for plot numbers see: Appendix 1)

The field work was done in early April till mid May 2014, during favourable weather conditions, in daylight (ALBANO et al. 2013). The sampling sites were selected so as to represent different habitat conditions. Each site was divided into plots ca. 5–10 km apart. Every plot was ca. 100–200 m² and included limestone, sandstone and desert vegetation, all on a limestone bedrock (BUCCIARELLI 1961, REITANO et al. 2012). The following data were recorded for every plot: coordinates, location and date of collection, altitude, description, habitat type, topography, leaf-litter, herbaceous layer, bushes, trees, human activity and type of soil. Geographic coordinates of the collecting plots were recorded using a GPS, and a map illustrating the distribution of the species which had been found alive before (KALTENBACH 1934, 1942, ABBES et al. 2011).

All possible microhabitats were included in visual search for snails; both live specimens and shells were collected. The samples were put in plastic bags and transferred to the laboratory for identification and morphometric studies.

IDENTIFICATION AND SHELL MEASUREMENTS

The shell morphology provides important diagnostic characters, especially that type specimens of most of the species recorded in this study are only shells (KORÁBEK et al. 2015). Besides identification, the specimens were subject to morphometric examination since much morphometric variation could be expected. The shells (shell diameter SD, spire diameter S, shell height SH, aperture diameter AD, aperture height AH) were measured using electronic calliper and the whorls (W) were counted to the nearest 0.25 as described by KERNEY & CAMERON (1979). Only adult shells were measured. Because of the expected geographical variation notes on local variation are given even for the otherwise well-known species.

RESULTS

Thirteen species representing four families and nine genera have been recorded from the North Coast belt, the Helicidae and Geomitridae being the most diverse, represented by six and five species respectively – Helicidae: *Theba pisana* (O. F. Müller, 1774), *Eremina desertorum desertorum* (Forskål, 1775), *E. d. irregularis* (Férussac, 1821), *E. d. zitteli* Boettger, 1889, *Eobania vermiculata* (O. F. Müller, 1774), and *Helix pronuba* Westerlund et Blanc, 1879; and Geomitridae: *Xeropicta krynickii* (Krynicki, 1833), *Xerocrassa tuberculosa* (Conrad, 1852), *X. tanousi* (Westerlund, 1892) *Xerocrassa* sp., and *Cochlicella acuta* (O. F. Müller, 1774). Two other families were represented by singular species – *Rumina saharica*

Fig. 2. Shell of *Theba pisana*, King Mariout, Alexandria

Pallary, 1901 (Subulinidae) and *Sphincterochila* sp. (Sphincterochilidae). The species represented by live individuals were *T. pisana*, *C. acuta*, *X. krynickii*, *E. vermiculata*, *E. desertorum desertorum*, *E. d. irregularis*; the remaining taxa were found as empty shells only: *H. pronuba*, *R. saharica*, *X. tuberculosa*, *X. tanousi*, *Xerocrassa* sp., *E. d. zitteli* and *Sphincterochila* sp. The last category should be regarded as endangered (Appendix 1).

Family: Helicidae Rafinesque, 1815

Theba pisana (O. F. Müller, 1774)

Figs 2–3

For shell description, size and colour variation see Cameron (2008) and USDA (2008), for shell colour polymorphism and its genetic background in related species see Johnson (1980), Cook (1998), Baker (2002) and Scheil et al. (2012). The widest shells were those from King Mariout Alexandria (plot 5) with the maximum diameter of 17.61 ± 1.21 mm; the greatest shell height was 12.93 ± 1.42 mm (Table 1). The largest shells reported in the literature were ca. 25 mm in diameter and up to 6 whorls (USDA 2008). Some shells were ivory white with no bands or with only a coloured dot on the apex, some had a variable number of narrow brown spiral bands and a pinkish tint around the aperture. Many specimens were white to orange in ground colour, with pale to dark brown spiral bands, continuous or broken into dots, or squares, or with any combination of these markings.

T. pisana was widespread on the North Coast, especially in Nubareia and Alexandria. The most abundant populations were found in King Mariout (plot 4), the least abundant on the road from Alexandria to Marsa Matrouh, 251 km, near Borg El Arab (plot 8). Cowie (1990) mentioned that *T. pisana* was common throughout its natural range in Alexandria and along

Fig. 3. *Theba pisana* in its habitat, King Mariout, Alexandria (plot 4)

Table 1. Shell measurements of *Theba pisana*

Collecting plot	N	SD	SH	S	AD	AH	W
King Mariout (plot 4)	15	15.30–18.20; 17.31 ± 0.79	11.54–13.98; 12.91 ± 0.77	9.32–11.21; 10.08 ± 0.53	7.40–9.98; 9.01 ± 0.58	7.59–9.70; 8.71 ± 0.62	4; 4 ± 0
King Mariout (plot 5)	15	14.70–17.37; 16.04 ± 0.73	10.48–13.88; 11.84 ± 0.85	8.28–10.68; 9.37 ± 0.61	7.36–9.48; 8.31 ± 0.54	7.30–9.34; 8.11 ± 0.56	4; 4 ± 0
Road from Borg el Arab to Marsa Matrouh, 251 km (plot 8)	15	15.92–19.71; 17.61 ± 1.21	10.26–15.53; 12.93 ± 1.42	8.94–11.79; 10.26 ± 0.79	8.17–10.90; 9.44 ± 0.83	7.41–10.87; 8.98 ± 0.92	4; 4 ± 0

the Mediterranean region in Egypt. JOHNSON (1981) reported that the species was found on sand dunes near Perth, Western Australia, in a habitat very similar to that of a sand desert.

T. pisana is common on cultivated land and thus often a pest, especially in citrus orchards and crop fields where it causes serious damage to plants introduced in Egypt. The species is very abundant in the desert habitats of Alexandria, i.e. King Mariout and Borg El Arab, which are close to some cultivated fields and wasteland (Fig. 3). These sites are under pressure from grazing, livestock trampling, cultivation, and irrigation system which has an effect on the dispersal of the snails. *T. pisana* is a serious pest of cereal crops and pastures in many parts of the world, for example in Southern Australia, Israel and South Africa, where it causes significant losses in ornamental plants, fruit trees and vegetables (AVIDOV & HARPAZ 1969, SWART et al. 1976, GODAN 1983, BAKER 1986).

T. pisana was found on a wide range of plants (Fig. 3) of various families: *Eryngium creticum* (Apiaceae), *Nicotiana glauca* (Solanaceae), *Thymelaea hirsuta* (Thymelaeaceae), *Echinops spinosissimus*, *Centaurea calcitrapa*, *Aster squamatus*, *Glebionis coronaria*, *Xanthium strumarium* (Asteraceae), *Phyla nodiflora* (Verbenaceae), *Mesembryanthemum crystallinum* (Aizoaceae), *Papaver rhoeas* (Papaveraceae), *Thymus vulgaris* (Lamiaceae), *Dicanthium annulatum*, *Avena fatua*, *Cynodon dactylon* (Poaceae), *Anagallis arvensis* (Primulaceae) and *Melilotus indicus* (Fabaceae). It preferred shrubs which provided shade and it stayed close to the soil where humidity was higher. It was abundant in places with herbaceous plants, and low-growing shrubs where thousands of aestivating snails could be found.

Eremina desertorum desertorum (Forskål, 1775)

Figs 4–5

For shell description, measurements and differences between the forms of the species see KALTENBACH (1934, 1942), BIGGS (1959) and ALI et al. (2016). The greatest diameter recorded among the shells measured in this study was 27.53 ± 1.44 mm, while the greatest height was 20.84 ± 1.44 mm (road to El Alamein, 125 km, S of El Alamein, plot 19) (Table 2).

The distribution of *E. d. desertorum* was presented by KALTENBACH (1942). In the studied area it was the second most common desert snail next to *E. d. irregularis*, which was more widely distributed south of El Alamein, from plot 19 to plot 26; it occurred in fair abundance in the Egyptian deserts. The species was very abundant in plot 24, on the international road, 55 km, S of El-Alamein. The plot had moderately dense vegetation with plants ca. 10–30 mm high; in other plots the numbers were low. According

Fig. 4. Shells of *Eremina desertorum desertorum*, showing different colour patterns (banded and unbanded), South El Alamein North Coast

Fig. 5. *Eremina desertorum desertorum* in its habitat, road to El Alamein, 55 km, South El Alamein (plot 24)

to PALLARY (1924) *E. d. desertorum* was common in Egyptian deserts; its life span was six years. The species was also found in petrified forests east of Cairo, east of Wadi Liblabe (KALTENBACH 1934), as well as in Suez, Ismailia, Port Said, Sinai Peninsula to the mountains in the environs of Gebel Dalfa and close to the Palestinian border. Besides, it was recorded from Fayum, North Alexandria, 40 km west of Wadi Natrun, to the edge of the rocky desert, the Libyan plateau (KALTENBACH 1934, 1942). It was common in Abu-Rawash, a desert district near Cairo, responding readily to environmental conditions (FAHMY 1949). BLUME (1952) found live *E. d. desertorum* on the coastal dunes at Abukir of Alexandria along the Mediterranean Sea to King Mariout. The species was also reported as common in north-east African countries (KALTENBACH 1942).

The plots in which the species was found were arid and natural; there was no shade, the leaf-litter was thin and the vegetation sparse. *E. d. desertorum* was most frequent on *Haloxylon salicornicum* (Amaranthaceae), *Astragalus spinosus* (Fabaceae), *Thymelaea hirsuta* (Thymelaeaceae), *Artemisia monosperma* and *Faunaea* sp. (Asteraceae). Figure 5 shows the snail in its natural habitat on wild desert plants in South El Alamein.

Table 2. Shell measurements of *Eremina desertorum desertorum*

Collecting plot	N	SD	SH	S	AD	AH	W
Road to El Alamein, 125 km (plot 19)	5	25.75–28.84; 27.53 ± 1.44	19.07–22.89; 20.84 ± 1.44	12.8–16.46; 14.95 ± 1.41	12.33–16.18; 14.03 ± 1.67	11.97–13.68; 12.47 ± 0.71	3–4; 3.25 ± 0.43
Road to El Alamein, 100 km (plot 21)	3	24.53–25.32; 24.82 ± 0.43	16.8–17.01; 16.89 ± 0.11	12.33–13.52; 13.10 ± 0.67	10.84–11.89; 11.24 ± 0.56	10.74–11.32; 11.01 ± 0.29	3; 3 ± 0
Road to El Alamein, 95 km (plot 22)	5	22.49–23.61; 23.17 ± 0.44	16.33–16.98; 16.69 ± 0.25	12.31–14.01; 13.18 ± 0.74	10.80–11.90; 11.39 ± 0.47	10.05–10.90; 10.39 ± 0.38	3; 3 ± 0
Road to El Alamein, 55 km (plot 24)	30	21.76–30.92; 25.76 ± 2.44	15.95–24.41; 18.76 ± 2.31	12.37–20.11; 14.84 ± 2.09	10.48–17.91; 13.27 ± 2.05	8.07–20.12; 12.06 ± 2.40	3–4.25; 3.38 ± 0.45

Eremina desertorum irregularis (Férussac, 1821)

Figs 6–8

The description of morphological, anatomical and colouration characters of *Eremina* with its different forms was presented by KALTENBACH (1934, 1942). ALI et al. (2016) mentioned that the two taxa of *E. desertorum*: *E. d. desertorum* and *E. d. irregularis*, differed in their shell size and shape, and were separated by a narrow hybrid zone west of Alexandria. The lack of differences in the genital organs supports their classification as subspecies rather than distinct species. BIGGS (1959) measured two forms near Marsa Matrouh which were close to KALTENBACH's (1934)

Fig. 6. Shells of *Eremina desertorum irregularis*: top – unbanded shell showing growth ridges, road from Marsa Matrouh to El Sallum, 183 km, North Coast; bottom – shell with brown bands, Ezbet El-Sheik Sabir area, S of El Hammam

Fig. 7. *Eremina desertorum irregularis* in its habitat, El Hammam, plot: Manor of El-Sheikh Saber, Ezbet El Sheikh Saber, S of El Hammam (plot 12)

Fig. 8. *Eremina desertorum irregularis* in its habitat, El Dabbah, North Coast (plot 17)

Table 3. Shell measurements of *Eremina desertorum irregularis*

Collecting plot	N	SD	SH	S	AD	AH	W
Borg El Arab (plot 7)	15	26.04–32.87; 30.25 ± 1.86	20.95–30.67; 24.37 ± 2.36	13.65–18.77; 16.02 ± 1.38	13.65–17.81; 15.16 ± 1.16	12.32–15.18; 13.88 ± 0.83	3–4; 3.31 ± 0.37
El Hammam City, Manor of El-Sheikh Saber (plot 12)	30	24.41–38.29; 32.91 ± 3.69	18.65–32.36; 24.91 ± 3.57	10.12–22.30; 16.33 ± 3.04	9.52–21.53; 15.93 ± 3.04	7.50–17.21; 13.42 ± 2.71	3–4; 3.64 ± 0.39
Road to Marsa Matrouh, 175–176 km (plot 14)	10	29.00–34.28; 31.01 ± 1.69	21.66–25.65; 23.31 ± 1.31	13.50–16.79; 15.08 ± 1.10	14.78–16.83; 15.63 ± 0.62	12.84–14.67; 13.71 ± 0.61	3–4; 3.25 ± 0.41
Road to Marsa Matrouh, 173 km (plot 15)	10	27.90–35.38; 31.37 ± 2.06	21.41–25.80; 24.28 ± 1.26	14.09–16.69; 15.61 ± 0.77	13.75–16.94; 15.83 ± 0.90	12.28–15.31; 14.12 ± 0.88	3–3.25; 3.1 ± 0.13
Road to Marsa Matrouh, 155 km, El Dabbah (plot 17)	30	21.76–33.82; 28.60 ± 3.26	15.61–27.30; 21.17 ± 3.22	8.22–17.88; 13.19 ± 2.92	9.80–19.83; 14.61 ± 2.76	6.38–14.78; 10.88 ± 2.61	3–4; 3.25 ± 0.32
Road to Marsa Matrouh, 155 km, El Dabbah (sub-fossils) (plot 17)	5	31.32–36.53; 34.22 ± 1.97	18.67–28.61; 25.37 ± 4.31	9.61–18.22; 15.13 ± 3.33	12.92–19.56; 16.29 ± 2.70	10.54–14.90; 12.83 ± 1.89	3.25–4; 3.7 ± 0.41
Road to Marsa Matrouh, 180 km (plot 13)	30	24.93–38.66; 31.96 ± 3.38	19.84–30.87; 25.12 ± 2.97	11.45–19.82; 16.58 ± 2.13	11.08–20.03; 15.92 ± 2.06	8.25–16.14; 13.37 ± 1.96	3–4; 3.55 ± 0.46
Road from Marsa Matrouh to El Sallum, 183 km (plot 36)	30	29.29–37.91; 34.30 ± 2.29	20.71–33.24; 28.12 ± 2.61	12.24–21.17; 18.35 ± 1.79	13.75–22.62; 18.29 ± 1.62	12.17–17.38; 14.64 ± 1.49	3–4; 3.89 ± 0.28
Road from Marsa Matrouh to El Sallum, 128 km (plot 38)	10	31.44–38.34; 34.37 ± 2.1	21.84–28.21; 25.77 ± 1.88	14.48–18.48; 17.04 ± 1.29	15.58–20.00; 17.47 ± 1.52	13.30–18.25; 15.28 ± 1.27	3–4; 3.27 ± 0.39

measurements of *E. d. irregularis* but slightly larger: 24.6 × 20.2 mm and 22.8 × 20.0 mm. See also *E. d. desertorum*.

For details of shell measurements see Table 3. The shell diameter was 34.37 ± 2.1 mm, while the shell height was 25.77 ± 1.88 mm. The sub-fossil shells were 34.22 ± 1.97 mm in diameter and 25.37 ± 4.31 mm in height. The size varied with location and habitat. The height of the growth ridges in the aperture averaged 0.34 ± 0.11 mm (n=5), 0.28 ± 0.15 mm (n=9), 1.0 ± 0.4 mm (n=5) and 0.67 ± 0.31 mm (n=35) for the plots on the road to Marsa Matrouh, 175–176 km (plot 14), the road from Marsa Matrouh to El Sallum, 128 km (plot 38), the road from El Hammam to Marsa Matrouh, 155 km (plot 17) and the road from Marsa Matrouh to El Sallum, 183 km (plot 36). The shells were white with some creamy to brown bands (road from Marsa Matrouh to El Sallum, 183 km (plot 36), El Hammam, Manor of El Sheikh Saber south of El Hammam (plot 12), with 4–5 interrupted brown bands, no growth ridges and reflected lip (e.g. road from El Hammam to Marsa Matrouh, 180 km (plot 13)), or white with no bands or only light creamy bands (El Dabbah).

The range of *E. d. irregularis* in the studied area extends from Borg El Arab, and Manor of El-Sheikh Saber "Ezbet El-Sheikh Saber" south of El Hammam (plot 12) to plot 45 ca. 10 km from El Sallum which is a very arid desert with very sparse vegetation. The species was also found between Marsa Matrouh, along the road to Siwa till 245 km and the road of Ber El Nos, 25–30 km, to El Garah close to plot 31. Kaltenbach (1934) recorded *E. d. irregularis* from a part of the Arabian desert, east and south-east of Cairo to the Red Sea, 800 m a.s.l., from the Libyan desert, beginning at 150 km of Wadi El Natraun, as well as from the west, then from the Mediterranean Coast along to Marsa Matruoh and from the south to the Siwa Oasis, Gebel Atakka and from Mokattam near Cairo. Biggs (1959) found the species in the deserts east of the Nile.

The shell size and shape were correlated with the climate gradient from cooler and more humid conditions along the Mediterranean coast to arid and hot conditions. The decrease in body size with decreasing precipitation and increasing temperature might be explained by the limited feeding time in the more arid regions. The shape differences between the taxa are partly an indirect consequence of selection for body size, but are also directly affected by selection for reduction of aperture size (Ali et al. 2016). The subspecies was found on a wider range of plants than the preceding form: *Thymelaea hirsuta* (Thymelaeaceae), *Pituranthos tortuosus* (Apiaceae), *Atriplex halimus, Haloxylon salicornicum* (Amaranthaceae), *Picris radicata, Echinops spinosissimus, Xanthium strumarium, Senecio desfontainei, Centaurea aegyptiaca, C. calcitrapa, Francoeuria crispa, Atractylis carduus* (Asteraceae), *Avena fatua, Cynodon dactylon, Schismus barbatus* (Poaceae), *Anabasis articulata* (Chenopodiaceae), *Capparis deserti* (Capparaceae), *Peganum harmala* (Zygophyllaceae), and *Carrichtera annua* (Brassicaceae).

Only three live snails and large numbers of empty shells of *E. d. irregularis* were found on plot 32, on the

way to El Garah, 20–30 km from Ber El Nos. This mass mortality may have been due to high temperatures and drought. The common plants were *Capparis deserti* (Capparaceae), *Francoeuria crispa* (Asteraceae) and *Anabasis articulata* (Chenopodiaceae).

Eremina desertorum zitteli Boettger, 1899

Fig. 9

For shell descriptions and measurements see Pallary (1924), Kaltenbach (1934) and Biggs (1959). The diameter of the shells from the Egyptian localities was 37.50 ± 2.96 mm while the shell height was 22.77 ± 2.61 mm (Table 4). The growth ridges in the aperture ranged from 4 to 10.3 mm, with the mean of 7.1 ± 3.6 mm (n = 4).

E. d. zitteli was found as sub-fossil, broken shells in the soft and smooth sandy soil, together with empty shells of *E. d. irregularis,* in only one plot at the north coast end of the road from Marsa Matrouh to Siwa, 270 km (plot 29) from where it had been earlier reported as common (Boettger 1899, Pallary 1924, Kaltenbach 1934, 1942, Biggs 1959). Pallary (1924) recorded *E. d. zitteli* from Marsa Matrouh. The species was found on the 40 to 60 km of the road from Marsa Matrouh to Siwa Oasis, particularly in Bir Kanayis, at ca. 55 km of the Siwa road west of Marsa Matrouh and along the Libyan Desert on the way from Cairo via the Wadi Natrun to Borg El Arab along the coast to Marsa Matrouh (Kaltenbach 1934).

Eobania vermiculata (O. F. Müller, 1774)

For shell description and measurements see Yildirim & Gumus (2004), Mohamed & Ali (2013) and Neubert et al. (2015). Blume (1952) collected 143 specimens of *E. vermiculata* for morphological study from semi-open gardens in Alexandria. The shell diameter ranged from 22.4 to 30.0 mm, with the mean values from 26.6 to 28.0 mm. Pallary (1909) reported the species from many localities in the northern part of Egypt such as El Ramleh, Sidi Gaber in Alexandria and Damietta.

E. vermiculata was recorded in one plot only: on the road from Alexandria to Marsa Matrouh, 251 km (plot 8), co-occurring with *T. pisana* on the same plants; only three live specimens were found. Mienis (1973) reported on populations of *E. vermiculata* in Palestine where the snail was found in all types of Mediterranean habitats: gardens, hedges and dunes. The author suggested that it may have been introduced to the area with ornamental garden plants, which were imported from other Mediterranean countries.

E. vermiculata is common in Egypt and is regarded as a threat to cultivations. It is not native in the region but was introduced with seedlings and other plant material from infested nurseries to the area with more shade and higher humidity. On the North Coast the species is found on *Anagallis arvensis* (Primulaceae), *Phyla nodiflora* (Verbenaceae), *Melilotus indicus* (Fabaceae), *Avena fatua* and *Cynodon dactylon* (Poaceae).

Helix pronuba Westerlund et Blanc, 1879

Fig. 10

For shell description see Neubert (2014). The diameter of the examined shells was 23.62 ± 1.77 mm and the height was 21.48 ± 1.83 mm (Table 5).

The location and insolation as well as rainfall have an effect on the shell thickness and size (Rensch 1932, Kaltenbach 1950a). The specimens of *Helix* from Egypt were mostly dark-lipped (Neubert & Korábek 2015).

Fig. 9. Shell of *Eremina desertorum zitteli*, showing keel and growth ridges, road from Marsa Matrouh to Siwa, 270 km (plot 29)

Table 4. Shell measurements of *Eremina desertorum zitteli*

Collecting plot	N	SD	SH	S	AD	AH	W
Road from Marsa Matrouh to Siwa, 270 km (plot 29)	6	34.29–41.39; 37.50 ± 2.96	20.47–27.59; 22.77 ± 2.61	19.61–23.61; 21.47 ± 1.67	16.37–22.69; 18.55 ± 2.35	13.61–18.68; 16.24 ± 1.94	3–3.25; 3.04 ± 0.10

Fig. 10. Shell of *Helix pronuba*, road from Borg El Arab to Marsa Matrouh, 245 km (plot 29)

Table 5. Shell measurements of *Helix pronuba*

Collecting plot	N	SD	SH	S	AD	AH	W
Road from Borg El Arab to Marsa Matrouh, 245 km (plot 9)	4	21.13–25.22; 23.62 ± 1.77	18.97–23.18; 21.48 ± 1.83	9.84–11.02; 10.52 ± 0.49	14.45–16.92; 16.21 ± 1.18	10.41–12.56; 11.79 ± 1.02	3; 3 ± 0

The species was found on the road from Borg El Arab, Alexandria to Marsa Matrouh, 245 km (plot 9). *H. pronuba* was previously recorded from dunes of Abukir Alexandria in Egypt, which is a semi-desert area (BLUME 1952); the species is common in southern Tunisia, including Djerba, where it is sympatric with *H. melanostoma* and is common in a few localities in Algeria, such as St-Denis-du-Sig, Mostaganem and Constantine (NEUBERT 2014). KALTENBACH (1950a) reported genus *Helix* in the west of Alexandria, Marsa Matrouh in the direction of Sidi Barani, coastal regions, and in Libya i.e. Beni Gazi, Cyrenaica, Tobruk, Tripolitania, and Syrte extends till Tunis. In Cyrenaica Libya the genus accompanying with terrestrial fauna *Rumina decollata* and *Xerocrassa barkaensis*.

The soil in the only plot with that species was dry and sandy; the ground was uneven. Around eight empty shells, four of them adult, were collected.

Family: Geomitridae C. Boettger, 1909

Xeropicta krynickii (Krynicki, 1833)

Figs 11–12

For shell descriptions and measurements see USDA (2008) and NEUBERT et al. (2015). The measured shells came from five plots in Alexandria region of the North Coast. The maximum diameter averaged 15.25 ± 1.09 mm and the mean shell height was 10.01 ± 0.69 mm in the samples from the road from Borg El Arab, Alexandria to Marsa Matrouh, 25 km (plot 8), while the smallest mean shell diameter was 12.50 ± 0.53 mm and the mean shell height was 8.27 ± 0.49 mm in King Mariout samples (plot 5) (Table 6). The colour varied from creamy or white to brown-banded with light background; the bands were either continuous or broken into squares or dots.

X. krynickii was abundant on the border of King Mariout till Borg El Arab, mainly in plot 4, with sandy soil, big rocks, and moderately dense vegetation with wild herbs. The species was also found on the road to El Alamein, south of El Alamein, 125 km (plot 19), in an arid plot with small wild plants and short vegetation, and on the road to Marsa Matrouh, 30 km (plot 28) as empty shells only.

X. krynickii was probably introduced also to the Dodecanese Islands, Cyprus and Crete (SCHÜTT 2001, WELTER-SCHULTES 2012). It is distributed

Fig. 11. Shell of *Xeropicta krynickii*, King Mariout, Alexandria

Fig. 12. *Xeropicta krynickii* in its habitat, South Borg El Arab, Alexandria

Table 6. Shell measurements of *Xeropicta krynickii*

Collecting plot	N	SD	SH	S	AD	AH	W
King Mariout (plot 4)	6	12.36–14.59; 13.41 ± 0.77	7.97–12.08; 8.97 ± 1.54	6.33–9.73; 7.34 ± 1.21	5.55–7.29; 6.37 ± 0.67	5.47–6.08; 5.83 ± 0.22	4; 4 ± 0
King Mariout (plot 5)	3	11.99–13.05; 12.50 ± 0.53	7.71–8.62; 8.27 ± 0.49	6.64–7.10; 6.82 ± 0.24	5.79–6.44; 6.15 ± 0.33	5.11–6.54; 5.84 ± 0.72	4; 4 ± 0
Borg El Arab (plot 7)	11	12.37–13.79; 13.37 ± 0.39	8.14–10.84; 8.47 ± 0.71	6.44–8.33; 7.21 ± 0.53	6.48–7.12; 6.78 ± 0.17	5.91–7.07; 6.33 ± 0.36	4; 4 ± 0
Borg El Arab (plot 7)	9	11.90–15.16; 13.48 ± 1.01	7.90–11.19; 9.25 ± 1.15	6.39–8.99; 7.62 ± 0.88	4.91–7.63; 6.41 ± 0.86	5.00–7.55; 6.06 ± 0.80	4; 4 ± 0
Road from Borg el Arab to Marsa Matrouh, 251 km (plot 8)	6	13.92–16.98; 15.25 ± 1.09	9.28–11.07; 10.01 ± 0.69	7.62–9.63; 8.23 ± 0.76	6.12–7.86; 7.24 ± 0.60	5.78–7.09; 6.38 ± 0.47	4; 4 ± 0

around the Black Sea; its range extends as far as Middle East, it was recorded also from Podgorica (Montenegro), and Italy, extending to the Caspian Sea, Azerbaidzhan, Iran, Syria, Lebanon, Jordan, Israel and Egypt (De Mattia & Pešić 2014). According to Neubert et al. (2015) the species is distributed in the East Mediterranean region, central Middle East and Jordan.

In April most of *X. krynickii* were juveniles. The plants used by the species had narrow, needle-like leaves and dry stems (Fig. 12): *Thymelaea hirsuta* (Thymelaeaceae), *Pituranthos tortuosus* (Apiaceae), *Atriplex halimus* (Amaranthaceae), *Picris radicata* (Asteraceae), *Mesembryanthemum crystallinum* (Aizoaceae) and *Dicanthium annulatum* (Poaceae). The snails preferred *Echinops spinosissimus*, *Centaurea calcitrapa* (Asteraceae) and *Eryngium creticum* (Apiaceae).

Xerocrassa tuberculosa Conrad, 1852

Fig. 13

For description and measurements see Heller (2009) and Neubert et al. (2015). The diameter of

Fig. 13. Shell of *Xerocrassa tuberculosa*, road from Marsa Matrouh to El Sallum, 128 km (plot 38)

Table 7. Shell measurements of *Xerocrassa tuberculosa*

Collecting plot	N	SD	SH	S	AD	AH	W
Road from Marsa Matrouh to El Sallum, 128 km (plot 38)	3	8.89–15.33; 12.59 ± 3.32	6.10–12.80; 9.84 ± 3.42	5.64–10.19; 8.31 ± 2.37	4.27–8.41; 6.52 ± 2.09	4.80–7.25; 6.11 ± 1.23	3–5; 4 ± 1.0

the shells was 11.23 ± 3.31 mm, the shell height was 9.45 ± 4.74 mm (Table 7).

The species was found in one plot on the road from Marsa Matrouh to El Sallum, 128 km (plot 38). *X. tuberculosa* was also recorded from a wide area extending from Sinai, Egypt, to the coastal plains of Iran (BIGGS 1937) and from Umm el Jimâl, Jordan (NEUBERT et al. 2015). The species' range extends from Palestine, steppe and fruit land of Cyrenaica near the coast in north Libya to the Atlantic coast of Morocco. It was common as well in dry regions of the desert of Jedea, on the coast area of Red Sea, in the Negev desert and in the surrounding mountains of Sinai (FORCART 1975).

Only empty shells were found, most of them juvenile. The plot was arid with sparse vegetation.

Xerocrassa sp.

Fig. 14

The Geomitridae include a vast number of genera throughout the Palaearctic and its many sub-regions, and the species identification mostly requires examination of the genital anatomy, especially in *Xerocrassa* and *Xeropicta* (NEUBERT at al. 2015). It was impossible to identify the species because of the lack of live adults.

The snail was found in Borg El Arab Alexandria and (one empty shell) on the road from Marsa Matrouh to El Sallum, 45 km (plot 42). It was also observed on the road from Cairo to El Ain El Sokhna, east Cairo region, co-occurring with *X. tuberculosa*. *Xerocrassa* sp. was introduced in a number of areas worldwide, such as Israel and in Egypt.

Only empty shells, almost sub-fossil, were found. Most of them were juvenile, with very few adults. One shell of *Xerocrassa* sp. was found on the road from Marsa Matrouh to El Sallum, 45 km (plot 42). Its measurements were: diameter 15.12 mm, height 10.67 mm, spire 8.49 mm, aperture height 7.83 mm,

Fig. 14. Shell of *Xerocrassa* sp., road from Marsa Matrouh to El Sallum, 45 km (plot 42)

Table 8. Shell measurements of *Xerocrassa* sp.

Collecting plot	N	SD	SH	S	AD	AH	W
Borg El Arab (plot 7)	2	15.48–16.25; 15.86 ± 0.54	10.07–10.55; 10.31 ± 0.34	8.20–8.55; 8.38 ± 0.25	7.46–7.90; 7.68 ± 0.31	6.39–7.63; 7.01 ± 0.87	4; 4 ± 0

Fig. 15. Shell of *Xerocrassa tanousi,* road from Marsa Matrouh to El Sallum, 65 km (plot 41)

Table 9. Shell measurements of *Xerocrassa tanousi*

Collecting plot	N	SD	SH	S	AD	AH	W
Road from Marsa Matrouh to El Sallum, 130 km (plot 37)	11	7.71–10.00; 9.13 ± 0.66	5.63–7.44; 6.18 ± 0.58	4.48–6.25; 5.65 ± 0.50	3.72–5.00; 4.33 ± 0.38	3.70–5.68; 4.54 ± 0.53	3–4; 3.27 ± 0.46
Road from Marsa Matrouh to El Sallum, 65 km (plot 41)	6	8.09–9.49; 8.80 ± 0.53	5.71–6.70; 6.37 ± 0.38	4.96–5.79; 5.41 ± 0.32	3.93–4.49; 4.17 ± 0.18	3.92–4.66; 4.19 ± 0.30	3; 3 ± 0

aperture diameter 7.29 mm; 4 whorls. For measurements of the shells from Borg El Arab see Table 8.

Most of the shells were stuck in the sandy soil due to heavy rains followed by dry weather. The two plots were arid with sparse vegetation. *Stipagrostis plumosa* (Poaceae) was common.

Xerocrassa tanousi (Westerlund, 1892)

Fig. 15

For shell description see PALLARY (1924). The shells varied from white to creamy, with very fine and narrow interrupted bands on the body whorl. The shell diameter averaged 8.8 ± 0.53 mm and 9.13 ± 0.66 mm for the first and the second plots, while the shell height was 6.37 ± 0.38 mm and 6.18 ±0.58 mm, respectively (Table 9).

The species was found in two plots: on the road from Marsa Matrouh to El Sallum, 130 km (plot 37) and on the road from Matrouh to El Sallum, 65 km (plot 41). It was previously recorded from King Mariout, Alexandria (PALLARY 1924). Its range on the North Coast deserts of Egypt extends from Alexandria, Marsa Matrouh (El Dabbah, Sidi Barrani) to Sidi Barakat. In Libya, it is known from the environs of El Sallum, Bardia and Tobruk to Bomba in the north of the country (BRANDT 1959).

Only empty shells were found. The habitat was dry with short vegetation.

Cochlicella acuta (O. F. Müller, 1774)

Figs 16–17

For shell description and measurements see HELLER (2009), MOHAMED & ALI (2011), and NEUBERT et al. (2015). The shells found had 6–7

Fig. 16. Shell of *Cochlicella acuta* from King Mariout, Alexandria (plot 5)

Table 10. Shell measurements of *Cochlicella acuta*

Collecting plot	N	SD	SH	AD	AH	W
King Mariout (plot 3)	4	5.20–5.79; 5.54 ± 0.29	11.38–13.62; 12.68 ± 0.94	3.89–4.67; 4.13 ± 0.37	3.09–3.72; 3.29 ± 0.29	6–7; 6.75 ± 0.5
King Mariout (plot 5)	7	4.32–4.72; 4.53 ± 0.16	9.45–10.85; 10.09 ± 0.47	3.30–3.81; 3.55 ± 0.21	2.20–3.07; 2.69 ± 6.26	6–7; 6.57 ± 0.53

Fig. 17. *Cochlicella acuta* in its habitat, King Mariouot, Alexandria

whorls; the colour was white or creamy or pale yellow, often with darker bands, the colour and pattern were very variable. The growth-ridges were irregular and rather weak. For measurements of the shells from two plots in King Mariout see Table 10.

The species was found in four plots in King Mariout and Borg El Arab (plots 3–6). *C. acuta* is common in the Mediterranean region (KERNEY & CAMERON 1979, USDA 2008) and is regarded as a component of the Mediterranean fauna (DE SMET & VAN ROMPU 1989).

C. acuta was the second most common species in King Mariout and Borg El Arab, co-occurring with *T. pisana* in four plots, on the same plants and preferring *Thymelaea hirsuta* (Thymelaeaceae) and *Nicotiana glauca* (Solanaceae). The species was also found on *Centaurea calcitrapa*, *Aster squamatus*, *Glebionis coronaria, Xanthium strumarium*, *Hieronex* sp., *Echinops spinosissimus* (Asteraceae), *Eryngium creticum* (Apiaceae), *Mesembryanthemum crystallinum* (Aizoaceae), *Papaver rhoeas* (Papaveraceae), *Thymus vulgaris* (Lamiaceae), and *Dicanthium annulatum* (Poaceae). The habitat had dry sandy soil, with large sandstone rocks, moderately tall vegetation with thick wild herbs, as well as small trees and shrubs, and signs of grazing.

The species is regarded as an important agricultural pest of many strategic crops such as clover, wheat and citrus (GODAN 1983). It was observed to feed mainly on Egyptian clover, kidney bean and tomato in Kasfaryt and the Fayed district in Ismailia governorate (NEUBERT et al. 2015).

Family: Subulinidae P. Fischer et Crosse, 1877

Rumina saharica Pallary, 1901

Fig. 18

For shell descriptions, measurements and differences between *R. saharica* and *R. decollata* see BOURGUIGNAT (1864), PALLARY (1921), CARR (2002),

Fig. 18. Shell of *Rumina saharica,* road from Marsa Matrouh to El Sallum, 130 km (plot 40)

Table 11. Shell measurements of *Rumina saharica*

Collecting plot	N	SD	SH	AD	AH	W
Road from Marsa Matrouh to El Sallum, 130 km (plot 37)	16	7.03–9.34; 8.22 ± 0.60	22.05–29.47; 24.67 ± 2.27	4.49–8.89; 7.64 ± 1.07	3.72–5.93; 4.58 ± 0.53	5–8; 5.88 ± 0.88
Road from Marsa Matrouh to El Sallum, 128 km (plot 38)	3	7.89–8.28; 8.11 ± 0.20	22.05–26.38; 23.69 ± 2.34	7.61–7.98; 7.85 ± 0.21	4.21–4.63; 4.37 ± 0.22	5–7; 5.66 ± 1.15
Road from Marsa Matrouh to El Sallum, 80 km (plot 40)	3	7.69–8.99; 8.16 ± 0.71	22.37–24.95; 23.30 ± 1.43	7.66–8.37; 8.01 ± 0.35	3.86–5.02; 4.32 ± 0.61	5–6; 5.33 ± 0.58

MIENIS (2008) and PRÉVOT et al. (2015). The shells were cream-coloured, ranging from 8.11 ± 0.20 to 8.22 ± 0.60 mm in diameter and from 23.30 ± 1.43 to 24.67 ± 2.27 mm in height. The measured shells were found along the road from Marsa Matrouh to El Sallum at 130 km, 128 km and 80 km (plots 37, 38, 40) (Table 11).

The snail was found in the north coast region of Egypt: in El Dabbah, on the road to Marsa Matrouh, 155 km (plot 17); it was common on the road to Marsa Matrouh at 30 km (plot 28) and the road from Marsa Matrouh to El Sallum, at 130 km, 128 km, 100 km, 80 km (plots 37–40).

R. saharica is usually reported from the eastern part of the Mediterranean, but has probably been introduced by man in many places along the Turkish coast (SINGER & MIENIS 1993, HAUSDORF & HENNIG 2005).

Only empty shells were found. The habitat was arid with sandy soil and sandstone, and no signs of human interference. The common plants were *Haloxylon salicornicum* (Amaranthaceae), *Onopordum ambiguum* (Asteraceae), and *Stipagrostis plumosa* (Poaceae).

Family: Sphincterochilidae Zilch, 1960

Sphincterochila sp.

Fig. 19

For description of *Sphincterochila* see TRYON (1887), for ecology see LUCHTEL & DEYRUP-OLSEN (2001). Because the shells (Fig. 19) were damaged, no accurate measurements were possible. They were thick, medium-sized (ca. 25 mm in diameter), irregularly striated, chalky white with shining surface, smooth to coarsely granulated. They had five slightly convex whorls with shallow to moderately deep suture; the body whorl was rounded and wide. The aperture was rounded with a thick lip and the umbilicus closed by a thick reflection of the columellar peristome.

The reported diameter of *S. boissieri* is 22.17 mm, height 18.18 mm, and the number of whorls ca. 4.33 (KALTENBACH 1950b). The snail was reported from many parts of Cyrenaica, Libya, Syria, Negev Desert of Israel and Egypt living in arid habitats.

Fig. 19. Sub-fossil shells of *Sphincterochila* sp., road to El Sallum, 65 km (plot 41)

Sphincterochila sp. was found as empty sub-fossil shells in only one plot on the road to El Sallum, 65 km (plot 41). It is probably native in the region and becoming extinct due to the climate and environmental changes.

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APPENDIX 1

Collecting plots and recorded species listed according to the plot distribution on the map in Fig. 1

Plot No.	Collecting plot	Species	Living sample	Empty shell
1	King Mariout, Alexandria 31°01'46.60"N, 29°46'52.21"E	*Theba pisana*	×	
2	King Mariout, Alexandria 31°00'24.05"N, 29°44'01.84"E	*Theba pisana*	×	
3	King Mariout, Alexandria 30°59'57.74"N, 29°43'16.51"E	*Theba pisana*	×	
		Cochlicella acuta	×	
4	King Mariout, Alexandria 30°59'44.09"N, 29°42'17.08"E	*Theba pisana*	×	
		Cochlicella acuta	×	
		Xeropicta krynickii	×	
5	King Mariout, Alexandria 30°58'49.22"N, 29°40'24.28"E	*Theba pisana*	×	
		Cochlicella acuta	×	
6	South King Mariout, Alexandria 30°58'39.65"N, 29°39'59.32"E	*Theba pisana*	×	
		Cochlicella acuta	×	
		Xeropicta krynickii	×	
7	Borg El Arab, Alexandria coordinates unknown	*Xeropicta krynickii*	×	
		Eremina d. irregularis		×
		Xerocrassa sp.		×
8	Road from Borg el Arab to Marsa Matrouh, 251 km 30°59'16.78"N, 29°35'23.96"E	*Theba pisana*	×	
		Eobania vermiculata	×	
9	Road from Borg El Arab to Marsa Matrouh, 245 km 30°57'50.11"N, 29°33'14.94"E	*Theba pisana*	×	
		Eremina d. irregularis		×
		Helix pronuba		×
10	Road of Alexandria to Marsa Matrouh (North coast 44 km) 30°50'39.1"N, 29°16'01.9"E	*Theba pisana*		×
11	Road to Marsa Matrouh, 237 km 30°55'53.55"N, 29°28'42.43"E	*Theba pisana*	×	
12	El Hammam City, Manor of El-Sheikh Saber 30°50'01.32"N, 29°23'49.99"E	*Eremina d. irregularis*	×	
13	Road to Marsa Matrouh, 180 km 30°50'51.04"N, 28°55'13.95"E	*Eremina d. irregularis*	×	
14	Road to Marsa Matrouh, 175–176 km 30°51'44.68"N, 28°53'31.94"E	*Eremina d. irregularis*	×	
15	Road to Marsa Matrouh, 173 km: 30°52'42.86"N, 28°52'20.93"E; 30°52'38.73"N, 28°52'23.63"E; 30°53'23.65"N, 28°52'38.51"E	*Eremina d. irregularis*	×	
16	Road to Marsa Matrouh, 169–170 km 30°53'31.52"N, 28°51'01.98"E	*Eremina d. irregularis*		×
17	Road to Marsa Matrouh, 155 km, El Dabbah 31°02'13.49"N, 28°25'54.96"E	*Eremina d. irregularis*	×	
		Rumina saharica		×
18	Road to El Alamein, 128–129 km, South El Alamein 30°28'59.03"N, 30°10'57.36"E	*Eremina d. desertorum*		×
19	Road to El Alamein, 125 km 30°29'12.17"N, 30°09'51.87"E	*Eremina d. desertorum*		×
		Xeropicta krynickii		×
20	Road to El Alamein, 105 km 30°33'44.06"N, 29°58'01.81"E	*Eremina d. desertorum*		×
21	Road to El Alamein, 100 km 30°34'41.86"N, 29°55'08.01"E	*Eremina d. desertorum*	×	

Appendix 1 continued

Plot No.	Collecting plot	Species	Living sample	Empty shell
22	Road to El Alamein, 95 km 30°35'40.10"N, 29°52'13.02"E	*Eremina d. desertorum*	×	
23	Road to El Alamein, 65 km 30°39'16.45"N, 29°34'15.38"E	*Eremina d. desertorum*	×	
24	Road to El Alamein, 55 km 30°39'46.09"N, 29°28'02.45"E	*Eremina d. desertorum*	×	
25	Road to El Alamein, 32 km 30°41'45.65"N, 29°13'55.24"E	*Eremina d. desertorum*		×
26	Road to El Alamein, 25 km 30°42'53.57"N, 29°09'44.57"E	*Eremina d. desertorum*		×
27	Road to Marsa Matrouh, 100 km 31°03'18.74"N, 28°18'27.35"E	*Eremina d. irregularis*	×	
28	Road to Marsa Matrouh, 30 km 31°10'06.64"N, 27°36'01.95"E	*Rumina saharica*		×
29	Road from Marsa Matrouh to Siwa, 270 km 31°10'04.09"N, 27°02'31.49"E	*Eremina d. irregularis*		×
		Eremina d. zitteli		×
30	Road from Marsa Matrouh to Siwa, 245 km 31°01'42.94"N, 26°50'11.16"E	*Eremina d. irregularis*	×	
31	Ber El Nos, 25–30 km, to El Garah 30°44'16.57"N, 27°03'23.85"E	*Eremina d. irregularis*	×	
32	Road to El Garah village 30°42'04.74"N, 26°57'47.17"E	*Eremina d. irregularis*		×
33	El Garah village coordinates unknown	*Eremina d. irregularis*		×
34	Road from Marsa Matrouh to El Sallum, 200 km 31°15'35.32"N, 27°07'26.44"E	*Eremina d. irregularis*	×	
35	Road from Marsa Matrouh to El Sallum, 190 km 31°17'19.12"N, 27°01'32.97"E	*Eremina d. irregularis*	×	
36	Road from Marsa Matrouh to El Sallum, 183 km 31°18'24.20"N, 26°57'19.76"E	*Eremina d. irregularis*	×	
37	Road from Marsa Matrouh to El Sallum, 130 km 31°27'21.22"N, 26°25'42.06"E	*Rumina saharica*		×
		Xerocrassa tanousi		×
38	Road from Marsa Matrouh to El Sallum, 128 km 31°27'44.71"N, 26°24'31.27"E	*Rumina saharica*		×
		Xerocrassa tuberculosa		×
39	Road from Marsa Matrouh to El Sallum, 100 km 31°32'55.88"N, 26°08'13.46"E	*Rumina saharica*		×
40	Road from Marsa Matrouh to El Sallum, 80 km 31°36'17.15"N, 25°56'16.98"E	*Rumina saharica*		×
41	Road from Marsa Matrouh to El Sallum, 65 km 31°34'02.35"N, 25°47'33.59"E	*Xerocrassa tanousi*		×
		Sphincterochila sp.		×
42	Road from Marsa Matrouh to El Sallum, 45 km 31°30'47.53"N, 25°35'41.42"E	*Eremina d. irregularis*	×	
43	Road from Marsa Matrouh to El Sallum, 40 km 31°29'58.41"N, 25°32'47.33"E	*Eremina d. irregularis*	×	
44	Road from Marsa Matrouh to El Sallum, 20 km, 31°28'00.30"N, 25°21'00.23"E	*Eremina d. irregularis*	×	
45	Road from Marsa Matrouh to El Sallum, 10 km, 31°29'07.66"N, 25°14'50.73"E	*Eremina d. irregularis*	×	