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Tourism and Pollution: A negative impact on molluscs at Safaga, El Quseir, Marsa Alam and Wadi el Gamal, Red Sea

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Introduction: Although the molluscan fauna of the region Safaga, El Quseir, Marsa Alam and Wadi el Gamal have quite extensively been investigated during the past years, to my knowledge and by intensive search in literature no reports have been made on hotel pollution and landscape disturbance. Both have a negative impact on coral reefs and the general life of the intertidal zone of the mentioned areas. Organisms that live in such environment include a diversity of species as there are: molluscan echinoderms, worms, barnacles, small fish etc.. It leaves no doubt that marine life has dramatically deteriorated in the past twenty years. The construction of tourist accommodations and infrastructure caused by hotels, diving centres, diving and snorkelling places ensured that ecologically valuable areas have irrevocably been disturbed and that the landscape has changed dramatically.

The Environmental Impact of Hotels: The tourist industry at the Red Sea has become most of Egypt's main income, millions of dollars and Euros are flowing into the local economy, which also take its toll on the environment. During the past fifteen years, I have visited several hotels at the mentioned areas. At nearly all of those I have witnessed that practically all dominant species on geomorphologically structures (fringing reefs) and sandy beaches close to the shore have been affected or have vanished because of environmental changes. Usually the inner reef and reef crests are polluted by floating plastic and sediments of mineral matter. Such sediments are used for levelling the hotel and beaches and are supplied from other places that consist of other minerals and do not correspond with the original bottom, which results in an adverse impact on the fauna. Fine grains of this sand are blown up to the reef by wind, moved by rain and by cleaning and levelling out the beaches, with all its consequences due. While collecting shells at such polluted beaches, I noticed that lots of previously dominant species had vanished: *Naria turdus* (Lamarck, 1810), *Erronea caurica* (Linnaeus 1758), *Mauritia grayana* Schilder, 1930, *Virroconus coronatus* (Gmelin, 1791), *Pionocnus nigropunctatus* (Sowerby II, 1852), *Harmoniconus parvatus sharmiensis* Wils, 1986, *Darioconus pennaceus* (Born, 1778), *Virroconus sinaiensis* (Petuch & Berschauer, 2016), *Canarium mutalile* (Swainson, 1821), *Gibberulus gibberulus albus* (Mörch, 1850) were very to extremely small contrary to the congeners living in non-polluted areas. (Figs: Pl. 1-2.)

Landscape disturbance: Not only sediments are responsible, but also floating plastic, organic material, plastic cups, plastic cans, cigarette butts, batteries, rubber shoes, glass, wood debris, packaging waste and various sun protecting flacons are washed up and become anchored between and against an ancient shoreline. Such a shoreline is exposed above current water level, has existed since late Pleistocene age and consists of a diversity of material primarily derived from corals, molluscs and foraminifera. Al this material makes a good habitat for *Chitonidae, Littorinidae, Nacellidae, Neritidae, Planaxidae* and several other molluscs. At the harbours of Safaga and El Qusier, the shipping of phosphate and cement causes large clouds of dust settling in the adjacent areas. It leaves no doubt that these areas are polluted to a high degree and no life in the intertidal zone is perceptible. The coral reefs with their rich and diverse ecosystem are also in danger because of this.

I visited (9/2015) Sharm el Luli (Hankorab Beach) and Qulaan, which are considered as a part of the National park of Wadi Gamal. Both places are unique for snorkelling, a paradise with a variety of fish, turtles and large coral boulders. The beach shore of whitish sand is speckled with rock formations and one Bedouin construction was present, which gives sun protection to a few divers and scuba-divers. The intertidal zone was very rich in marine life and lots of molluscs were observed.

For the Class Gastropoda: *Casmaria unicolor* Pallary, 1926, *Casmaria beui* Buijse, Dekker & Verbinnen, 2013, *Casmaria* erinaceus (Linneaus, 1758), *Naria turdus* (Lamarck, 1810), *Gastridium geographus* (Linnaeus 1758), *Pionoconus striatus* (Linnaeus, 1758), *Tessellilconus tessulatus* (Born, 1778), *Cylinder neovicarius* (da Motta 1982), *Rhizoconus sumatrensis* (Hwass in Bruguiére, 1792), *Lambis truncata sebae* (Kiener, 1843), *Malea pomum* (Linnaeus, 1758), *Mitra bovei* Kiener, 1838, *Chicoreus ramosus* (Linnaeus, 1758), *Chicoreus virgineus* (Röding, 1798), *Malea pomum* (Linnaeus, 1758), *Mitra bovei* Kiener, 1838, *Gibberulus gibberulus albus* (Mörch, 1850), *Tricornis tricornis* (Lightfoot, 1786), *Thais savignyi* (Deshayes, 1844), *Tonna perdix* (Linnaeus, 1758). *Vexillum intermedium* (Kiener, 1838).

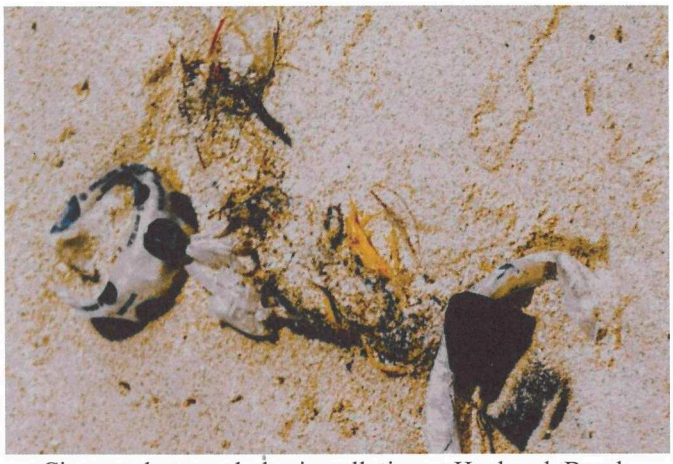
For the class Bivalvia: *Acar plicata* (Dillwyn, 1817), *Arca avellana* Lamarck, 1819, *Asaphis violascens* (Forsskäl in Niebuhr, 1775), *Barbatia foliata* (Forsskäl in Niebuhr, 1775), *Barbatia trapezium* (Lamarck, 1819), *Calista florida* (Lamarck, 1818), *Cardita variegata* Bruguiére, 1792, *Circe crocea* (Gray, 1838), *Circentia callipyga* (Born, 1778), *Dosinia eryhtraea* Römer, 1860, *Dosinia hepatica* (Lamarck, 1818), *Gafrarium pectinatum* (Linnaeus, 1758), *Clycimeris livida* (Reeve, 1843), *Lunulicardia auricula* (Niebuhr, 1775), *Soletellina ruppelliana* (Reeve,1857), *Tridacna maxima* (Röding, 1798) are species that were very common and frequently collected.

This very nice place has also attracted the attention of many tourists and their activity has caused extreme damage to this nice and natural environment. Tourists are little or not at all aware of preservation of biodiversity or preservation of the environment in general. It is obvious that tourism has an adverse impact on environments.

When visiting the mentioned places again (9/2019), the waterline was soiled by plastic cups, plastic bottles and cigarette butts. The beach of Hankorab Beach was overcrowded with tourists and Bedouin constructions had been extended to several ones. The intertidal zone had been very rich in molluscan and other life one year before, but now nearly none existed. Stones scattered in the literal zone were full of active life the year before, but had been taken away or bleached on all sides by the sun and all life up and under them had vanished.

Change is needed: there is no doubt that it can much longer continue this way. Despite government efforts, hotel and environmental pollution still happens. Resolving the pollution by forbidding plastic bags in food shops and supermarkets, does only yields a small effect. A more tactic measure is needed to save the beautiful beaches with their very rich marine life. Yet, in doing this, the government will miss lots out on big amounts of money. However, the harmful substances are an urgent and important issue not only for the regions of Safaga, El Quseir, Marsa Alam and Wadi el Gamal, but for all the coastal beaches, if not all marine life, which divers and tourist actually come for, will vanish.

Sharm el Luli (Hankorab Beach (9/2019) part of the Natural park of Wadi el Gamal



Cigarette butts and plastic pollution at Hankorab Beach (9/2019)

Tridacna maxima (Röding, 1798)
dead by sediment dust Marsa Alam (9/2019)

Building construction, plastic, wood and animal waste at El Qusier (9/2019)

Plate 1:

1 - 1c: ***Naria turdus*** (Lamarck, 1810)
very small-sized adult

2 - 2c: ***Naria turdus*** (Lamarck, 1810)
normal-sized adult

3: ***Canarium mutabile*** (Swainsos, 1821)
very small-sized adult

4 - 4d: ***Canarium mutabile*** (Swainson, 1821)
normal-sized adult

5 – 5b: ***Darioconus pennaceus*** (Born, 1778)
normal & small-sized

Plate 2:

1 - 1b: ***Mauritia grayana*** Schilder, 1930
small-sized adult

2 - 2a: ***Mauritia grayana*** Schilder, 1930
normal-sized adult

3: ***Erronea caurica*** (Linnaeus, 1758)
very small-sized adult

4 - 4c: ***Erronea caurica*** (Linnaeus, 1758)
normal & small sized

5 - 5b: ***Virroconus sinaiensis***
(Petuch & Berschauer, 2016)
normal & small sized

6 - 6c: ***Gibberulus gibberulus albus*** (Mörch, 1850)
normal & small-sized

Plate 1

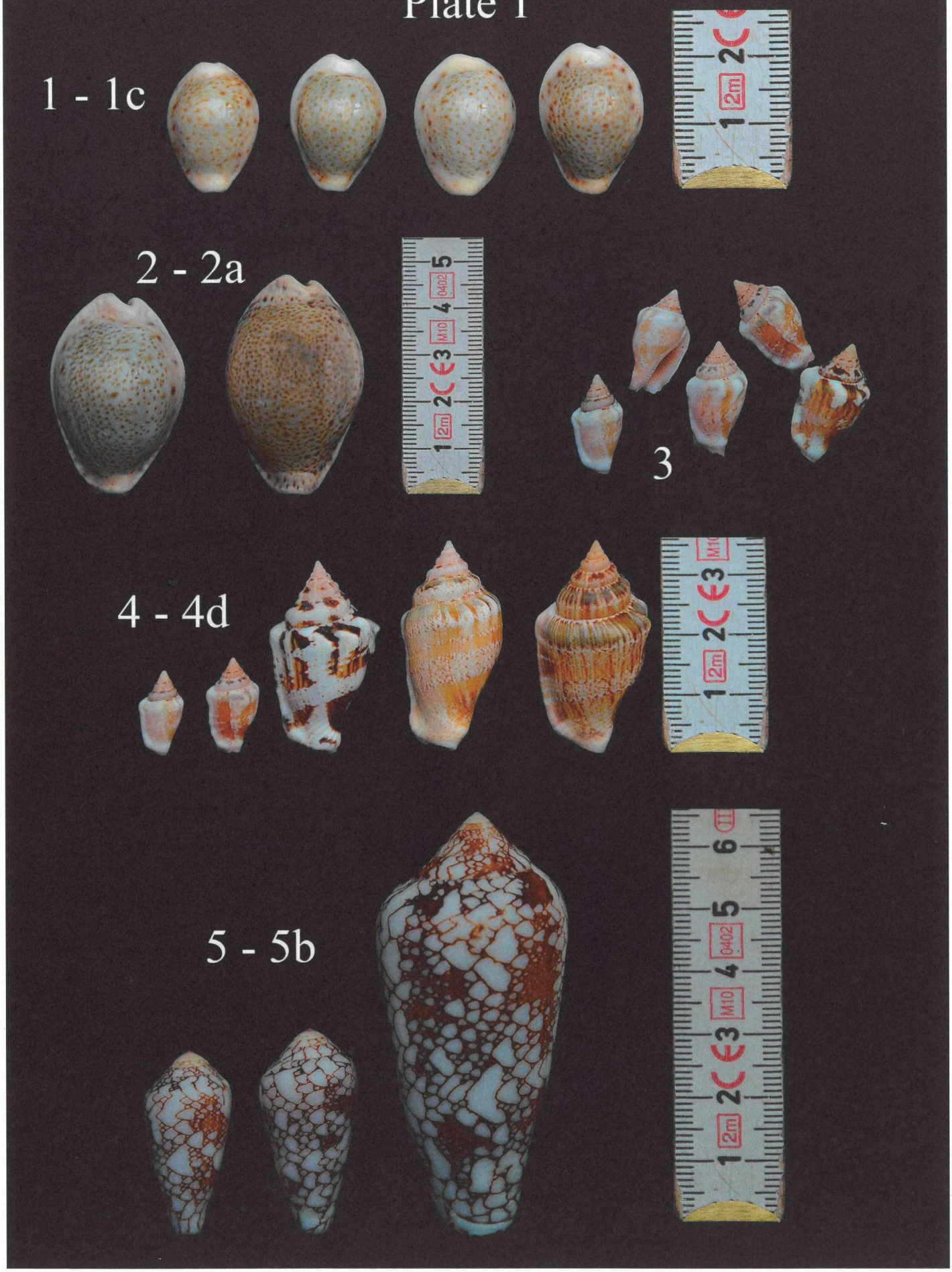
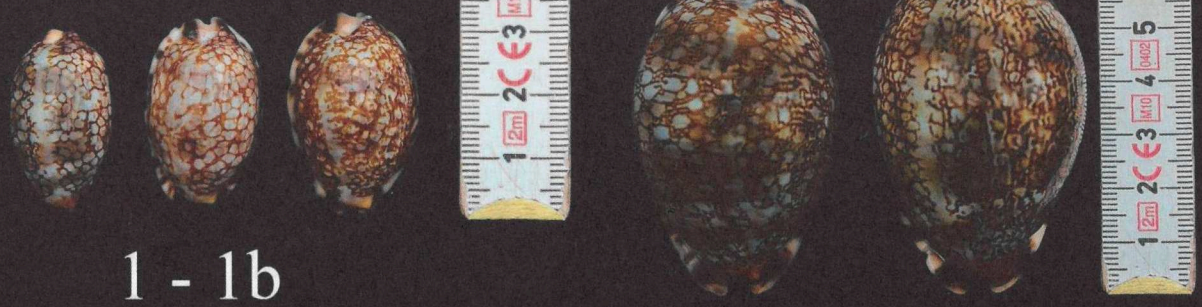
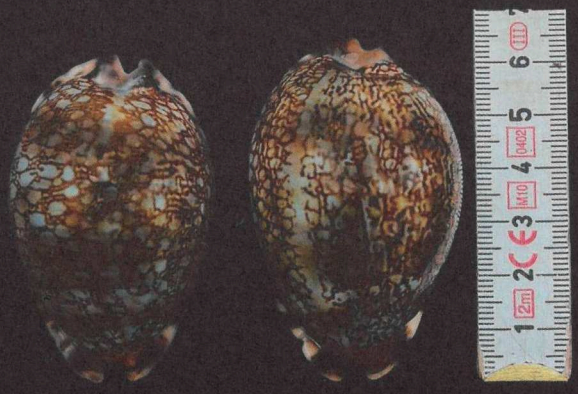


Plate 2



1 - 1b



2 - 2a

4 - 4c

3

5 - 5b

6 - 6c