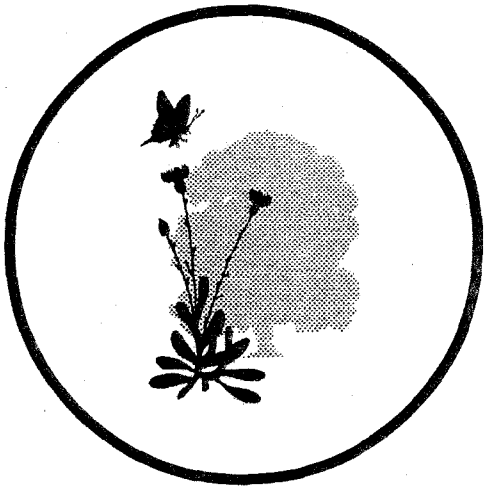
THE CENTRAL MEDITERRANEAN NATURALIST



Nature Trust (Malta)

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THE CENTRAL MEDITERRANEAN NATURALIST

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Nature Trust (Malta)

In 1998, three N.G.O.'s which shared the common aim of promoting awareness, conservation and study of Malta's natural heritage decided to join forces so as to form a single, more effective association. The organisations were the Society for the Study and Conservation of Nature, which was founded in 1962, and the more recently formed groups Arbor and Verde.

The merger resulted in the formation of Nature Trust (Malta) which was officially launched by His Excellency the President of the Republic on Friday, 8th January 1999. In June 2001, another organisation, the Marine Life Care Group also joined Nature Trust (Malta). The aims of Nature Trust (Malta) are to enhance public awareness and appreciation of the rich biodiversity of the Maltese Islands through educational campaigns, conservation schemes and research projects.

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PARASITES AND PESTS OF MEDICAL SIGNIFICANCE IN THE MALTESE ENVIRONMENT - A HISTORICAL REVIEW OF CULPRIT SPECIES

C. Savona-Ventura[1]

ABSTRACT

Parasites or pests with medical significance known to have affected or are affecting the Maltese community are listed. These include several protozoan helminth and arthropod parasite species. Other arthropod species identified as public health pests in Department of Health publications are also listed.

INTRODUCTION

The biomedical discipline of parasitology has traditionally been concerned only with the parasitic protozoa, helminths, and arthropods. It is generally assumed that the improvements in the general hygiene that have occurred in the second half of the twentieth century in Malta have made human parasitic infestations a thing of the past. The situation was however very much different prior to the mid-twentieth century and parasitology was an important discipline for the Maltese medical profession. In 1837, it was commented that "*taenia and other worms are so frequent, that they are scarcely considered sources of disease*" (Montgomery, 1837). Even today a number of parasitic species still affect Maltese human hosts.

The present study is an attempt to identify the various human parasitic species that have affected the Maltese community throughout the years. The study is based primarily on the 1937-1953 Annual Reports of the Medical and Health Department (M&H, 1937-1953). Other published sources that deal with aspects of medical parasitology in the Maltese Islands were availed of. More recent parasitic infestations are reported in the Infectious Disease Annual Reports for the period 1991-1999 (DOH, 1991-2000). Personal experience of medically important parasitic infestations over a near twenty-year period was also considered.

Protozoa

Giardia lamblia. This species is usually weakly pathogenic or non-pathogenic to humans. With marked infestation, the large numbers of parasites attached to the bowel wall may cause irritation and low-grade inflammation of the intestinal mucosa, with consequent acute or chronic diarrhoea.

Examination of faeces carried out in 1940 revealed one case of *Giardia* cysts (M&H 1937-1953). The species has been identified in returning tourists particularly from India and Pakistan (personal observation). Two cases of giardiasis infection were reported in the 1991-1999 Infective Disease Reports (DOH, 1991-2000).

Trichomonas vaginalis. This species restricts itself to the genitourinary system causing marked local symptoms. Sexual intercourse is the usual form of transmission of the infection, but it can also be transmitted by contaminated towels, etc.

The species is a common cosmopolitan parasite of both males and females in Malta, though its prevalence may have decreased in recent years (personal observation).

Leishmania infantum. Members of this genus undergo a complex life-cycle with alternating sexual and asexual reproductive phases involving two hosts (man or dog, and the sandfly *Phlebotomus sp.*). Only the first stage, the nonflagellated amastigote, occurs in the mammalian host.

Visceral lieshmaniasis is the classically described form of the disease in Malta; however in recent years cutaneous lieshmaniasis has been described (Vella-Briffa, 1985). The 1991-1999 Infective Disease Reports records 71 cases of visceral lieshmaniasis infection and 121 cases of cutaneous Lieshmaniasis (DOH, 1991-2000).

L. infantum zymodeme MON 1, was found to cause human and canine visceral leishmaniasis. *L. infantum* MON 78, which has so far been isolated only in Malta, was the agent of human cutaneous leishmaniasis. Both zymodemes were isolated from the same sandfly species *Phlebotomus perniciosus* (Gradoni, 1991).

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Entamoeba histolytica. This species is a parasite commonly found in the large intestine of humans. Invasion of the intestinal mucosal lining results in ulceration causing dysentery. The endemicity of *Entamoeba* was only confirmed after the 1913 epidemic. During the period 1941-45, a total of 313 cases were found to be positive on pathological faecal examination (M&H, 1937-53).

Toxoplasma gondii. This species is a coccidian protozoan of worldwide distribution that infects a wide range of animals and birds. The normal final host is the domestic cat. Human infections are usually asymptomatic, but can cause severe effects to the foetus when infection occurs during pregnancy.

Toxoplasma screening is usually carried out in Malta in cases of recurrent miscarriages and stillbirths. The prevalence rate of toxoplasma antibodies among Maltese pregnant women has been estimated at 23.8%, with an infective incidence of about 2-3 cases per 1000 pregnancies (Portelli, 1995).

***Plasmodium* sp.** The sporozoan protozoa of this genus are amoeboid intracellular parasites of vertebrates, with one habitat in red blood cells and another in cells of other tissues. Transmission to humans is by the bloodsucking bite of the female mosquito of the genus *Anopheles*.

Reported cases of malaria are generally exogenous cases imported from overseas. During 1991-1999, a total of 17 cases of exogenous malaria were reported (DOH, 1991-2000). However a case of endogenous malaria has been reported in the past, while the *Anopheles* mosquito has been reported to breed in Malta (M&H, 1937-53).

Helminths

Taenia ?saginata; Taenia ?solium. The Tapeworm is a gastrointestinal parasite that has a world-wide distribution and is transmitted to the human host through eating undercooked beef or pork. The Maltese preference of eating well-cooked meat protects against outbreaks of the disease, though uncooked sausages may be a source of infection. Faecal examination in 1940 showed eggs of *Taenia* in one case (M&H, 1937-1953).

Ascaris lumbricoides. The Roundworm is a small intestine parasite of world-wide distribution. It is transmitted through ingesting viable eggs from contaminated food or soil.

The first documented record of an epidemic infestation in Malta occurred during the insurrection of the Maltese against the French rulers at the end of the nineteenth century (Robert, 1804). The infestation is still occasionally encountered in individual patients (personal observation).

Enterobius vermicularis. Pinworm infestation usually occurs by anal-oral self-contamination and through contamination by food-handlers. It has a world-wide distribution. The infection is the commonest helminthic infestation present today in the Maltese community (personal observation).

Trichuris tricuria. The Whipworm has a world-wide distribution and is transmitted by ingestion of contaminated food. During the period 1940-41 faecal examinations carried out by the Pathology Department revealed two cases showing eggs belonging to this species (M&H, 1937-1953).

Arthropoda

Insecta

Dictyoptera

The cockroaches have become particularly adapted to the human environment and have colonised and flourished in artificial pseudotropical situations. They have become important domestic pests and can be a cause of food poisoning and other enteric infections. Three cockroach species of public health importance have been reported from the Maltese Islands (Sultana, 1995): *Blatta orientalis, Periplaneta americana* and *Supella supellectilium.*

Diptera

This Order includes several fly and mosquito species. Fly species have become closely associated with humans and adapted to the human domestic environment. They are thus of public health importance as pests and potential carriers of disease organisms causing food poisoning and other enteric infections. Forty-four species of Calliphoridae, Fanniidae and Muscidae have been identified in the Maltese Islands (Schembri at al., 1991; Ebejer and Gatt, 1999). They include the following species that are considered public health pests: *Musca domestica,, Calliphora vicina, Lucilia sericata, Fannia canicularis* and *Stomoxys calcitrans.*

Mosquitoes are fluid feeders, the males feeding on nectar and plant exudates, while the females are blood-suckers. Besides being a source of irritation because of the reaction of the host to the injected anticoagulant saliva, mosquitoes can also transmit disease. Several species have been reported from the Maltese Islands, particularly during research on the transmission of Brucellosis (Horrocks & Kennedy, 1906): *Culex pipiens, Culex fatigans (= C. quinuefasciatus), Culex spathipalpis (= Culiseta longiareolata), Stegomyia fasciata (= Aedes aegyptii)* and *Acartomyia zammitii (= Aedes zammitii)*

Other species reported in the 1941-42 Medical & Health Report (M&H, 1937-1953) include: *Theobaldia annulata* (= *Culiseta annullata*) and *Anopheles maculipennis*

A review of the Culicidae species recorded from the Maltese Islands (Gatt, 1996) confirms the presence of six

species previously recorded including: *Aedes zammitii* (Theobald), *Culex pipiens* Linnaeus, *Culiseta longiareolata* (Macq.) and *Anopheles maculipennis* Meig.

Gatt records for the first time five other culicid species from Malta: *Aedes caspius* (Pallas), *Aedes detritus* (Haliday),*Culex hortensis* Ficalbi, *Culex laticinctus* Edwards and *Uranotaenia unguiculata* Edw. The presence of two previously recorded species, *Aedes aegyptii* (Linn.) and *Culex quinquefasciatus* Say., could not be substantiated. *Culex laticinctus* was actually first recorded by Ramos *et al.* (1992), but Gatt was not aware of this record when he reported it for the first time in 1996. (Paul Gatt, pers. comm.)

Important dipteran vectors of human protozoal parasites described from the Maltese Islands include:

Anopheles maculipennis. Anopheline larvae were collected from the ditches at Salina and Chadwick Lakes "Wied il Qlieja". Malaria contracted locally in 1904, 1919 and 1941 is known to have occurred in the region (M&H 1937-1953). The species has not been recorded since 1943 and is considered extinct on the Islands (Gatt, 1996).

***Phlebotomus* sp.** The sandfly species of the Maltese Islands were identified and their life history studied in 1910 (Newstead, 1912; Marett 1913). They were found to belong to the species: *P. papatasii* Scop, *P. perniciosus* n. sp. Newstead, *P. minutus* Rond. and *P. nigerrimus* n.sp. Newstead.

The species that transmits visceral and cutaneous lieshmaniasis was identified in 1946 as *Phlebotomus papatasi* (M&H 1937-53); while the pathological role of the sandfly species *P. perniciosus*, first suggested in 1912, was recently reconfirmed (Gradoni, 1991).

Siphonaptera

Fleas were always closely monitored since they were considered a valuable index of the spread of plague epidemics. The Medical & Health Reports repeatedly give flea indexes and lists of flea species identified on rodents and other animals including cats and dogs. The rodent flea also helps the spread of murine typhus. During 1991-1999, a total of 331 individuals were reported to have suffered from murine typhus (DOH, 1991-2000). Zammit (1918) records the following rodent flea species: *Pulex irritans, Leptopsylla segni, Xenopsylla cheopis* and *Nospsyllus fasciatus.* Other flea species that may readily feed on humans in the domestic environment include the cat and dog flea *Ctenocephalides felis* and *C. canis.*

Hemiptera

The Hemiptera are generally plant feeders, however two families of "bugs", the Cimicidae and the Reduviidae, comprise species whose mouth-parts have become adapted for feeding on blood. Bedbugs (***Cimex ?lectularius*** and ***Cimex ?hemipterus)*** are temporary ectoparasites of humans and when not feeding on blood will hide in cracks, crevices and other harbourages in human habitations. The *Cimex* bedbug was noted to affect a household of low socio-economic status in the early 1970s (personal observation).

Anoplura

Lice are permanent ectoparasites of warm-blooded animals and are characteristically specific in their choice of host. Since they cannot survive for more than one day or two away from their chosen host, each species is confined to a particular mammalian or avian host.. The human body louse can transmit typhus fever. The head and pubic louse do not transmit disease. Human lice species recorded in the Maltese Islands include:

Pediculus humanus capitis. Head lice are transmitted by personal contact and by objects such as combs and hats. The number of children found to have head lice infestation in 1948 amounted to 1691 (M&H 1937-53). It is common among school children in Malta without regard to social status (personal observation).

Pediculus humanis corporis. Body lice are uncommon under good hygienic conditions. They are rarely seen in the Maltese community (personal observation).

Phthirus pubis. The crab louse is usually transmitted venereally. It is not commonly seen in the Maltese community (personal observation).

Arachnida

Ticks and mites are bloodsucking parasites of a variety of warm-blooded animals, especially cattle, sheep, deer and dogs. Occasionally they may be picked up by humans after walking through an infested area or when in close proximity to an affected animal. Ticks can transmit a number of diseases, including tick-borne typhus. Several ticks were found on rats in Malta, the commonest being *Laelaps echidninus*, which does not bite man (Zammit, 1918). Tick-borne typhus during the period 1991-1999 was reported to affect 80 individuals (DOH, 1991-2000).

Sarcoptes scabiei. This mite causes a transmissible skin infection characterised by superficial burrows, intense pruritus and secondary infection. Scabies is readily transmitted by skin-to-skin contact with an infected individual. The 1937-39 Medical & Health Reports documented 97 cases of scabies that were seen in the Dermatology Outpatients Department of the Government Hospital. A serious outbreak of scabies was reported during the Second World War resulting from the poor hygienic conditions of the wartime communal shelters. During 1940-42 the Medical & Health Reports document 836 cases of scabies (M&H, 1937-53).

Chilopoda

Centipedes usually have two strong pointed teeth that deliver a poison strong enough to kill its prey. *Scolopendra cingulata* is a particularly large species found in the Maltese Islands that can deliver a particularly painful bite to humans.

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GEOCHELONE ROBUSTA (ADAMS 1877): AN INSULAR GIANT?

Martin A. Thake[1]

ABSTRACT

Giant size is probably plesiomorphic among insular giant tortoises, that is they are probably descended from a giant tortoise ancestor that reached the island overland or by making a sea-crossing. *Geochelone robusta* is unlikely to have evolved giant size in Malta as most of the known fossil European species of *Geochelone* were giant tortoises and the ancestor of *G. robusta* is thus likely to have been a giant tortoise. This species was a palaeotropical relict, that is a survival from the time, earlier on during the Tertiary, when the climate of the region was warmer. *Geochelone robusta* survived the cold stages of the pleistocene and Quaternary because the climate in Malta during the very coldest stages did not include prolonged, severe frosts.

INTRODUCTION

Adams (1877) described two species of large tortoise from Zebbug cave, Malta, and Tagliaferro (1913) described yet another from Kordin (Corradino). Nevertheless, it seems likely that these specimens were different-sized individuals of the same species (Savona Ventura, 1984).

A *Geochelone* of large size has also been reported from Sicily (Burgio & Fiore, 1988; Burgio & Cani 1988). It is not known whether the Sicilian and Maltese *Geochelone* were conspecific or even closely related. *Geochelone (G.) robusta* (Adams, 1877) from Zebbug Cave, Malta, Middle Pleistocene) is believed to have exceeded one meter in length, and thus ranks among the giant tortoises of the fossil record. This paper examines the hypothesis that giant size evolved on the Maltese Islands.

DISCUSSION

The Island Rule. Vertebrate biologists have long shown an interest in insular giants and dwarfs that differ markedly in size from their relatives on the mainland. Van Valen (1973) summarised the information available by proposing a rule, known as Van Valen's rule or the Island rule. This states that small species of vertebrate evolve larger size on islands, whereas large species become smaller. Lomolino (1985) provided convincing evidence in favour of the Island rule, showing that the rule holds good for mammals. Numerous examples of insular gigantism and dwarfism have been reported in the literature (see Azzaroli, 1982; Adler & Levine, 1994; Case, 1978; Sondaar, 1977, 1991; Thaler, 1973; and references therein). Exceptions to the rule are, however, numerous, even among mammals, and the data available on insular birds and reptiles are by no means conclusive (Lundelius, 1990). Brown & Lomolino summarise modern research on the evolution of body size among vertebrates living on islands (Brown & Lomolino, 1998, pp 434—444).

Giant tortoises. As Auffenberg (1974) has pointed out, giant tortoises living on islands are not examples of insular gigantism. Giant tortoises have roamed all the continents except Australia and Antarctica since the Eocene, and they appear to have become extinct everywhere except on a few oceanic islands.

Fig. 1 documents the shrinkage of the range occupied by species of *Geochelone* in the Western Palaearctic. Most of the species included in the figure were giant tortoises, approaching or surpassing one metre in length of carapace. The maximum carapace length of living species in the genus varies from 26 to 125 cm (Ernst & Barbour, 1989). Small species of *Geochelone* also exist. However there are very few smaller species in the Tertiary fossil record of the Western Palaearctic, most of the *Geochelone* species being large or giant tortoises.

Thus it is likely that Malta was colonised by a species of *Geochelone* that was already very large, and it is unlikely that giant size evolved in the Maltese Islands.

Evidence from other insular giant tortoises. As Whittaker (1998) has pointed out, the issue is whether a particular species of giant tortoise on an island evolved large size on that island or whether it was already a giant when it reached the island. Arnold (1979) was the first to point out that giant species of *Geochelone* can make sea crossings and colonise islands and appear to have done so with higher frequency than small species of tortoise.

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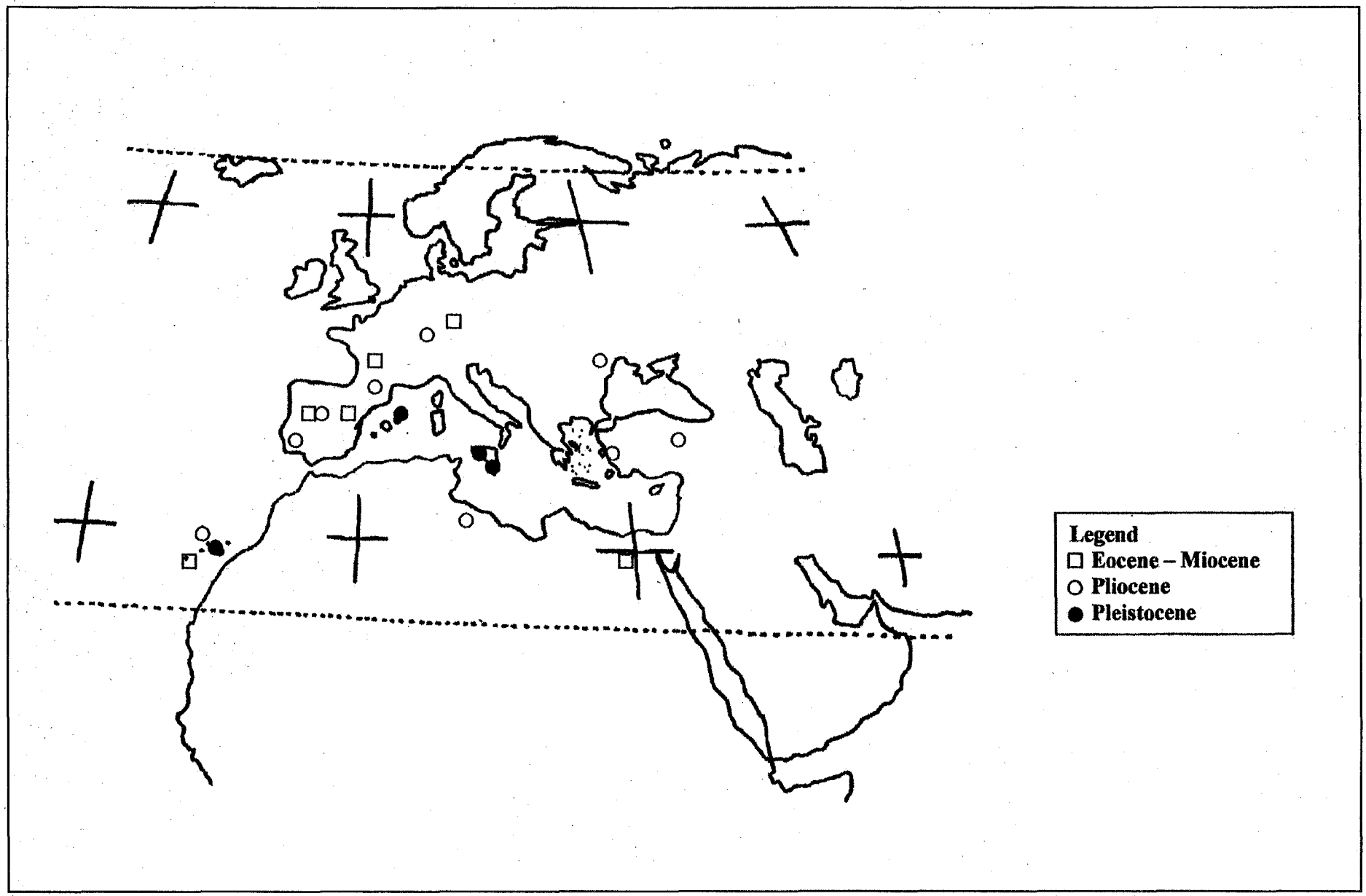

Fig. 1 The distribution of Western Palaearcic fossil species of *Geochelone*. Some of the symbols represent two or three species at approximately the same locality. Most of the species referred to in the figure were giant tortoises. The symbol on the Libyan coast refers to unnamed remains of a small *Geochelone* species.

Arnold refers to anecdotes in the literature well as modern observations to show that giant tortoises float well, with their heads well out of the water. Grubb (1971) saw an indidual *Geochelone (Aldabrachelys) gigantea* (Schweigger, 1812) floating in the sea 0.5 km from land in the marine lagoon inside Aldabra, Indian Ocean. Gaymer (1968) reported that this species has some control over its position and direction of movement while floating in sea-water. Giant tortoises are also more likely to survive prolonged immersion in sea-water and starvation than small species (Arnold, 1979). These facts mean that giant tortoises are better at colonising oceanic islands.

There is plenty of evidence to support these ideas. The Indian Ocean and Galapagos giant tortoises have clearly made sea crossings within the Mascarene, Seychelles and Galapagos archipelagoes. It is quite evident that the giant tortoises moved between the islands of each archipelago, making long sea crossings in the process.

Further support for this hypothesis comes from the subgenus *Aldabrachelys* of the genus *Geochelone*. Table 1 lists the distribution of the various species in this subgenus and gives their maximum size, showing that there are no small members of the subgenus *Aldabrachelys*. It seems likely that all *Aldabrachelys* species evolved from an ancestor that was very large, and that giant size is a plesiomorphy in this subgenus.

Further evidence comes from biochemical studies of the Galapagos tortoises [*Geochelone (Chelonoidis) elephantopus* (Harlan 1827) complex] (Marlow & Patton, 1981). These tortoises are not particularly closely related to any of the South American *Geochelone* species in the same subgenus. The mainland ancestor of the Galapagos tortoises is certainly extinct. Several extinct species of giant tortoise are known from South America, but no attempt has been made to identify a possible ancestor. As has happened elsewhere only small to large tortoises have survived in South America, all giant tortoises being extinct.

Hutterer *et al.* (1997) present information that could be interpreted to mean that *Geochelone* species increased in size in the Canary Islands. However the authors consider that more evidence is required before a definite conclusion can be reached.

In summary there is no clear evidence to suggest that insular giant tortoises have evolved giant size after colonising an island. It appears, rather, that giant size is plesiomorphic among such tortoises.

A Palaeotropical relict. Examination of figure 1 shows that during the Pleistocene, giant species of *Geochelone* are known only from Malta, Sicily, Minorca and the Canary Islands. Auffenberg (1974) argued that giant tortoises became extinct on mainland Europe and north America during the late Tertiary because they were unable to escape the cold by digging a burrow or taking refuge in

Table 1. The subgenus *Aldabrachelys* (genus *Geochelone*) on islands in the Indian Ocean.

Species	Locality	Age	Maximum size (cm)
G. (A) laetoliensis Meylan & Auffenberg 1987	Laetoli, Tanzania	Late Pliocene	114
G. (A) abrupta (Grandidier 1868)	Madagascar	Quaternary	125
G. (A) grandidieri (Vaillant 1885)	Madagascar	Quaternary	140
G. (A) daudinii (Dumeril & Bivron 1835)	Seychelles (granitic islands)	Recent (extinct)	80
G. (A) arnoldi (Bour 1987)	Seychelles (granitic islands)	Recent (living)	90
G. (A) gigantea (Schweigger 1812)	Aldabra	Quaternary to Recent (living)	106

Note. Data are from Bour (1987) and Meylan & Auffenberg (1987). The estimate for *G. laetoliensis* was made by the present author, using data in Meylan and Auffenberg (1987). The remains of *G. laetoliensis* are fragmentary but this species may have been ancestral to the Indian Ocean species.

a natural cavity, as the genera *Testudo* and *Gopherus* can do. If this argument is correct, the survival of *Geochelone robusta* in Malta until the arrival of humans in the Late Pliocene demonstrates that prolonged severe frosts did not occur in Malta, even during the coldest stages of the Pleistocene.

The earth's climate has cooled steadily since the end of the Cretaceous, 65 million years ago. By 12 - 14 Ma, mountain glaciers had begun to appear on high mountains in the higher latitudes of the northern hemisphere, and there was a permanent ice-sheet on Antarctica. Further sharp cooling took place around 6 - 5 Ma, with an ice-sheet appearing over the North Pole. During the Late Pliocene, around 2.5 Ma, a very sharp cooling took place and the earth's climate began to alternate by 4 to 10°C globally during climatic cycles. There is some evidence that large continental glaciers appeared in the northern hemisphere at this time and continued to appear during cold stages. Around 0.9 Ma, during the Pleistocene, temperature fluctuations increased markedly, and cold stages became colder. Most of the Pleistocene was colder than the present climate. Climates as warm as the Holocene have prevailed for only 10% of the time during the last 250,000 years (Bryant, 1997; Burrows, 2001; Prentice & Denton, 1988).

It seems likely that the appearance of continental ice-sheets in Northern Europe around 2.5 Ma, or shortly afterwards during the Late Pliocene, brought cold winters to most of the northern half of Europe, with frequent severe frosts. It is tempting to speculate that the continental European giant tortoises became extinct at some time during the Late Pliocene, but the fossil record of the genus *Geochelone* is far too meagre and the dating too imprecise to allow this hypothesis to be tested using the data in the literature.

Extinction. The extinction of *Geochelone robusta* in Malta appears to have occurred after the arrival of modern Man. Adams (1977) lists the contents of Zebbug cave, where giant tortoise bones were found. The remains of *Equus, Hippopotamus, Cervus, Elephas, Leithia, Cygnus* and *Anas* suggest that the cave was used as a larder by primitive humans. Caves remain cool in summer, virtually free from flies and the contents are safe from scavenging carnivores. Unfortunately the contents of Zebbug cave have not been dated reliably using modern methods. It seems reasonable to suppose that extinction was brought about by humans hunting the giant tortoises for food.

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THE GRAPSID CRAB *PERCNON GIBBESI* (MILNE EDWARDS, 1853) (CRUSTACEA, DECAPODA, BRACHYURA), A NEW ADDITION TO THE MARINE FAUNA OF MALTA

John J. Borg[1] and John Attard-Montalto[2]

ABSTRACT

The first records and known distribution in Maltese waters of the grapsid crab *Percnon gibbesi*, an alien species, are presented.

The grapsid Crab *Percnon gibbesi* (H. Milne Edwards, 1853) is distributed along the coasts of California to Chile, Florida to Brazil and Madeira to the Gulf of Guinea (Williams 1984). The first Mediterranean occurrence of this crab was reported in 1999 from the Balearic Islands (Garcia L. & Revireigo B., 2000) and it was later recorded from the island of Linosa (Pelagian Islands) (Relini *et* al., 2000). A year later it was present in Pantelleria and mainland Sicily, where it was reported to be spreading rapidly and establishing stable populations (Pipitone *et al* 2001).

On 23 June 2001, a small crab was found dead at Tigne Beach, Sliema, Malta by one of the authors (J.A-M) and it was taken to the National Museum of Natural History (NMNH), Mdina, Malta for identification. The specimen was identified as a female of either *Percnon gibbesi* or *P. planissimum*; the genus *Percnon* has not been reported previously from Maltese waters. After further examination the specimen was confirmed as *P. gibbesi* .

Another dead specimen, this time a male, was found at the same locality on 6 October 2001. Nineteen other individuals were observed in the Tigne Beach area between July and November 2001, when rough seas prevented further observation (see Table 1). Most observations included single specimens but groups of five and six were also observed. All specimens were amongst boulders at depths between 0.5 and 7 metres. The two dead specimens are deposited at the National Museum of Natural History, Mdina.

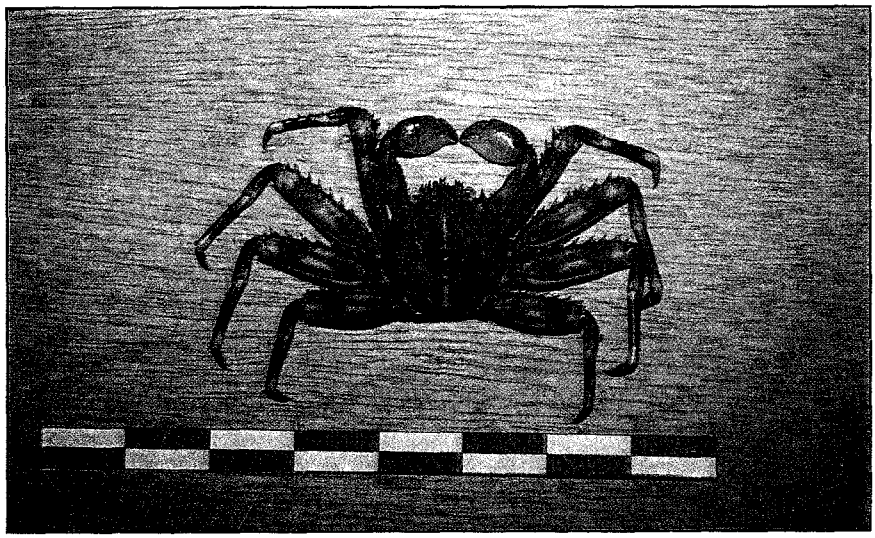

Photo John J. Borg

Fig. 1. The first specimen of *Percnon gibbesi* (Milne Edwards, 1853) found in Malta, a female from Tigne Beach, 23.06.01. (Scale graduation = 2 cm)

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Numerous observations of this crab were made in 2002, all from several rocky areas. The following were recorded in the summer of 2002: 5 individuals (2 adults and 3 juveniles) from il-Qaliet opposite the Cavalieri Hotel, 1 adult at Ghar Qawqla, Gozo and 1 adult at Mgarr ix-Xini, Gozo (D.Dandria pers comm.); 4 adults at Xlendi, Gozo and several individuals at Marsalforn, Gozo (M.Gatt and O. Spiteri pers.comm.). The crab was also noted in several localities along the Bahar ic-Caghaq coast (M.A.Falzon pers. comm.) and along the south coast of Malta (M. Spiteri pers. comm. and personal observations). The largest number was 37 individuals distributed over a relatively wide area at Tigné, counted by one of the authors (J. A-M) on 28 June 2002. An unconfirmed record from St. Julian's bay (M. Gatt pers. comm.) raises the possibility that this crab was already present in Maltese waters in the summer of 2000.

The carapace is disc-like, the front tridentate, deeply cut by antennular furrows; margins of median tooth armed with 2 spines, anterolateral margins with four acute teeth. All walking legs possess a row of spines on the anterior margin of the merus. Chelipeds with spinose merus and carpus, palm with small pilose area proximally on inner surface and pilose groove proximally on upper surface. The carapace is brownish in colour; the leg joints are marked with golden yellow rings. [Description based on Williams (1984) and Falciai & Minervini (1995)].

It is the authors' opinion that the introduction of this crab in the Mediterranean may be the result of aquarium escapes, as the species is popular with marine aquarium enthusiasts. The species is known in the aquarium trade as "Sally Lightfoot", although this name was originally reserved for the grapsid species from the Galapagos Islands, *Grapsus grapsus*. But it is also possible that the introduction into the Mediterranean and eventual spread may be natural considering the west (Balearics) to east (Pantelleria, Sicily) spread.

At this stage the possible impact of this alien species on the local fauna can only be speculative. What is certain is that its numbers are increasing rapidly. D. Dandria (personal communication) made an interesting observation at Mgarr ix-Xini, Gozo, where a specimen, which he observed walking on a vertical rock face at a depth of only 20cm, was chased off by another crab, the indigenous *Pachygrapsus marmoratus*. It escaped very rapidly, seeming to "jump" through the water from one rock to another about 20 cm away. In fact this fast retreating behaviour has also been observed in other cases when these crabs were approached.

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Table 1. Records of *Percnon gibbesi* observed by the authors in 2001.

Date	Location	Depth	Number	Sex	Age	Status
23.06.01	Tigne Beach	0.5m	1	F	Adult	Dead
23.07.01	Sliema Pitch	7m	1	?	Adult	Live
05.09.01	Tigne Beach	1m	2	?	Adult	Live
03.10.01	Tigne Beach	1m	1	?	Adult	Live
04.10.01	Tigne Beach	1m	1	?	Adult	Live
07.10.01	Tigne Beach	5m	1	F	Adult	Dead
16.10.01	Ghar id-Dud pool	1m	1	M	Adult	Dead
21.10.01	Tigne Beach	1m	2	1M/1?	Adult	Dead
21.10.01	Tigne Beach	1m	5	?	2 ad. 3 juv	Live
01.11.01	Tigne Beach	1m	6	?	2 ad. 4 juv	Live

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LONGHORN BEETLES (COLEOPTERA, CERAMBYCIDAE) OF THE MALTESE ISLANDS (CENTRAL MEDITERRANEAN)

David Mifsud[1]

ABSTRACT

The longhorn beetles of the Maltese Islands are reviewed based on literature records and collected material. A total of 29 species are included of which three, *Arhopalus ferus* (Mulsant, 1839), *Hesperophanes sericeus* (Fabricius, 1787) and *Phoracantha recurva* Newman, 1840 are recorded for the first time. Five species, *Phoracantha semipunctata* (Fabricius, 1775), *Phoracantha recurva* Newman, 1840, *Cerambyx nodulosus* Germar, 1817, *Cerambyx carinatus* Küster, 1846 and *Phryneta leprosa* (Fabricius, 1775) are considered as introductions and locally established. The records of *Cerambyx miles* Bonelli, 1823, *Cerambyx scopolii* Füsslins, 1775, *Ropalopus clavipes* (Fabricius, 1775), *Oberea* (*Amaurostoma*) *erythrocephala* (Schrank, 1776) and *Agapanthia cynarae cynarae* (Germar, 1817) are considered doubtful or in need of confirmation and until then, these species are excluded from the cerambycid fauna of the Maltese Islands. For each species all known Maltese localities, larval host plant development, global distribution and any other notes where relevant are provided.

INTRODUCTION

The Cerambycidae is a very large family, comprising some 30-35,000 described species in about 4,000 genera. Most species are found in tropical and subtropical regions of the world, whereas the European fauna is composed of only 625 species (Althoff & Danilevsky, 1997). Most cerambycids are of a very characteristic form, usually having an elongate body, with long to extremely long antennae, hence their common name of longhorn beetles. All cerambycids feed on vegetable material and can be conveniently divided into two groups; the xylophagous species, whose larvae feed in wood, and the phytophagous species with larvae feeding in herbaceous plants. In North and Central Europe, the xylophagous species predominate, but in Southern Europe and the Mediterranean Region, the number of phytophagous species is considerable.

Cerambycids attack mostly dead or damaged trees, but some species may attack healthy trees causing considerable damage. Larvae may take from a few months to several years to develop. Some species are monophagous with larval development taking place in only one host plant, others are oligophagous feeding on only a few, usually related, host plants; polyphagous species have the ability to develop in different unrelated host-plants. Many species of longhorn beetles are of economic importance, attacking commercial timber and fruit trees. Adults feed on flowers, soft foliage, bark, sap or fruit. They are usually short lived, dying once reproduction and egg laying are completed.

HISTORICAL REVIEW

The first mention of longhorn beetles from Malta was by Gulia, who, in 1857 delivered a series of lectures on the insect fauna of these islands. These lectures were published a year later and in this work, Gulia (1858) stated that he collected 13 indigenous species of longhorn beetles. Of these, he mentioned *Marimus funestus* (sic!) [= *Morinus funereus* (Mulsant, 1863)], *Prionus coriarius* (Linnaeus, 1758), *Hammaticherus heros* (sic!) [= *Cerambyx cerdo* Linnaeus, 1758] and *Rosalia alpina* (Linnaeus, 1758). Due to the fact that a substantial number of insect species mentioned in this work are considered to be unreliable (e.g. Mifsud, 2000), these four records will not be considered further. Reiche (1877) described *Oberea melitana*, presumably from material collected in Malta. In 1890, McLachlan indicated that a serious enemy of orange trees in Malta was the larva of a large longhorn beetle (*Cerambyx miles* Bonelli, 1823) which bores into the lower parts of the stem and down into the roots, making large galleries (Anonymous, 1890). In 1894, the Maltese naturalist Alfredo Caruana Gatto published a work entitled *"Common beetles of the Maltese Islands"* (Caruana Gatto, 1894). In this work, he mentioned three longhorn beetles, one on asphodel, *Agapanthia cynarae cynarae* (Germar, 1817) and two on rosaceous trees, *Cerambyx nodulosus* Germar, 1817 and *Niphona picticornis* Mulsant, 1839.

In 1907, Cameron and Caruana Gatto published a list of Coleoptera of the Maltese Islands. This important work is

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still the only faunistic work dealing with all beetle groups. In this work (Cameron & Caruana Gatto, 1907), sixteen species of Cerambycidae were recorded of which, one, was included on the basis of earlier records. Luigioni (1929), in his work on the Italian Coleoptera, included Cameron & Caruana Gatto's records. In 1916, Andres, a prisoner of war, published a list of Lepidoptera, Hemiptera and Coleoptera he collected from these islands. In this work, he mentioned *Hesperophanus griseus* Fabricius [= *Trichoferus griseus* (Fabricius, 1792)], a record which was overlooked by all subsequent works dealing with the study of locally occurring longhorn beetles.

Borg (1922) mentioned *Cerambyx* spp. which caused local damage to fruit trees. Borg (1939) in a paper entitled "*Our Insect Visitors*" mentioned the capture of a male and a female of *Rosalia alpina* (Linnaeus, 1758), from near a carpenter's workshop at Tarxien who made use of the ash-tree wood for his trade and *Morimus lugubris* (sic!) [= *Morinus asper* (Sulzer, 1776)] and *Morinus funereus* (Mulsant, 1863) from a heap of imported firewood at Marsa. The Ph.D. work of Saliba, "*Studies on Cerambyx species infesting fruit trees in Malta*", was the basis of most of his publications on *Cerambyx* spp. (1972a; 1972b; 1974a; 1974b; 1977). Schembri (1975) reported the capture of *Cordylomera spinicornis* (Fabricius, 1775) from Santa Venera from imported wood. A second record of this species was also reported by Mifsud & Booth (1997) from Ghammieri in Marsa.

After a lapse of nearly 80 years from Cameron & Caruana Gatto's catalogue (1907), Schembri & Sama (1986) published a thorough work on the Cerambycidae of the Maltese Islands. In this work they provided a brief review of earlier works dealing with local longhorn beetles, an annotated list of 22 species (of which 5 represented new records to these islands) and included brief notes on earlier records of imported species.

Cilia (1989) contributed an annotated list of endemic, rare, threatened and/or scientifically interesting beetles in the Red Data Book for the Maltese Islands (Schembri & Sultana, 1989). In this work he included information on nine species of Cerambycidae entirely based on published information.

In recent years, the present author was also much involved in the study of longhorn beetles occurring in Malta. In about 15 years since the publication of Schembri & Sama's work (1986), eleven new records were added, four of which were introductions which are nowadays locally established (Mifsud, 1993; Mifsud & Booth, 1997; Mifsud & Dandria, 2002; present work).

MATERIAL AND METHODS

The compilation of the following annotated species list of the Cerambycidae of the Maltese Islands is based on literature records and on material identified (public and private collections) by the present author in the past 10 years. Some material was also obtained by rearing larvae of longhorn beetles in the laboratory. This method is particularly useful for Cerambycidae and may reveal the presence of other interesting species in future work. A total of 458 specimens were examined during this study. In order to keep this work relatively compact, only the localities in the Maltese Islands for each species are provided. Where available, the Maltese localities from the earlier literature are included first (with the corresponding reference), followed by new localities based on material examined during the present study. For the new records and species known from single captures, full collecting data is provided. Brief information on host plants (after Sama, 1988, 2002; Bense, 1995), global distribution (after Sama, 1988, 2002) and any other relevant notes, where appropriate, are also included. Species which were reported as accidental introductions and never locally established are not included in this work.

ANNOTATED SPECIES LIST

1. *Arhopalus ferus* (Mulsant, 1839)

Local distribution - Malta: Rabat, Qrendi and Naxxar.
Material examined - Malta: Rabat, 24.viii.2001, 1 ex., leg. P. Sammut (attracted to light); Qrendi, 25.viii.2001, 1 ex., leg. D. Magro, Qrendi, 17.vi.2002, 1 ex., leg. D. Magro; Naxxar, 3.vii.2001, 1 ex., leg. A. Seguna (actinic light trap).
Global distribution - North Africa, Europe, Caucasus, Transcaucasia, Syria, Israel, Siberia and China. Widely distributed in Europe except Fennoscandia, reaching southern Spain, Italy and Greece. *A. ferus* (Mulsant) is more thermophilous than *A. rusticus* (Linnaeus, 1758), replacing the latter in many southern countries.
Host plants - Larval development takes place in conifers (*Pinus*, *Picea*, *Abies* and *Larix*). In the southern part of its distributional area, only *Pinus halepensis*, *P. nigra*, *P. sylvestris* and *P. leucodermis* are reported as host plants. Initially larvae feed subcortically and later tunnel the wood of dead standing trunks and stumps, often in the basal region or in exposed roots.
Notes - New record for the Maltese Islands.

2. *Icosium tomentosum atticum* Ganglbauer, 1882

Local distribution - Malta: Msida (Mifsud & Booth, 1997), Rabat, Wied Babu and Naxxar.
Material examined - Malta: Rabat, 16.vii.2001, 2 exs., leg. P. Sammut (attracted to light); Naxxar, 27.vi.2001, 1 ex., leg. A. Seguna, Naxxar, 16.vi.2001, 1 ex., leg. A. Seguna (actinic light trap); Wied Babu, 16.vi.2002, 1 ex., leg. D. Magro.
Global distribution - East Mediterranean with records from Eastern Italy up to the Middle East.
Host plants - Larval development takes place in the dead wood of conifers (*Juniperus*, *Cupressus*, *Thuja* and *Callitrix*). Initially larvae feed subcortically and later

penetrate the heartwood to pupate.
Notes - Prior to this study, this species was known from a single record which was erroneously assigned to the nominal subspecies (Mifsud & Booth, 1997).

3. ***Hesperophanes sericeus*** **(Fabricius, 1787)**

Local distribution - Malta: Rabat.
Material examined - Malta: Rabat, 21.ix.2001, 1 ex., leg. P. Sammut (attracted to light).
Global distribution - Throughout the Mediterranean Region, from North Africa (including Egypt) and Iberian Peninsula to southern France, Caucasus, southern Turkey, Iraq, Jordan and Israel.
Host plants - Larval development often takes place in dead wood of thick trunks at ground level or roots of deciduous trees such as *Juglans*, *Pistacia lentiscus*, *Vitis vinifera*, *Olea*, *Platanus*, *Quercus*, *Paliurus*, various fruit trees, and dry roots of *Halocnemum strobilaceum*.
Notes - New record for the Maltese Islands.

4. ***Trichoferus griseus*** **(Fabricius, 1792)**

Local distribution - Malta: Cospicua (Andres, 1916) and Kalkara (Mifsud & Booth, 1997).
Global distribution - Circum-Mediterranean with records from southern Europe, North Africa (including Egypt), Cyprus, southern Turkey, Iraq, Jordan and Israel. Widespread in southern and south-eastern Europe from the Iberian Peninsula, southern France, Italy, Balkans (predominantly along coastal regions) to Bulgaria, Greece including Crete, southern Ukraine and Crimea (Sama, 2002).
Host plants - Larval development takes place under bark and in wood of dry branches and stems of *Ficus carica*. The species is also reported from *Pistacia* and *Rosa* but these records should be regarded as incorrect or occasional (Sama, 2002).
Notes - *T. griseus* (Fabricius) was originally recorded from the Maltese Islands by Andres (1916). His record is based on a single specimen collected in June from the Verdala barracks. This record was overlooked by Schembri & Sama (1986) and Mifsud & Booth (1997).

5. ***Trichoferus fasciculatus*** **(Faldermann, 1837)**

Local distribution - Malta: Birkirkara, Wied is-Sewda, Gzira, Wied il-Hemsija, Hal-Far, San Pawl tat-Targa (Schembri & Sama, 1986), Naxxar, Msida (University grounds), Maqluba (Qrendi), Wied Babu, Zejtun, Kalkara and Rabat.
Global distribution - Circum-Mediterranean species with a distribution similar to *T. griseus* (Fabricius), except more widespread, eastward as far as Azerbaidzhan and northern Iran; uncommon in the eastern Mediterranean (southern Turkey and Israel). In Europe rather common and widespread only in the south, reaching southern France in the north-west and Ukraine (?) and Crimea in the east. Reported also from the Canary Islands and Madeira where local populations were described as *T. senex* Wollaston, 1854 and later sometimes referred to as *T. griseus* (Fabricius), but representing at most a subspecies of *T. fasciculatus* (Faldermann) (Sama, 2002).
Host plants - Larval development takes place in the branches and trunks of various broadleaf trees including *Sorbus*, *Cytisus*, *Quercus*, *Castanea*, *Spartium*, *Coronilla*, *Rhus*, *Paliurus*, *Colutea*, *Punica*, *Ceratonia*, *Pistacia*, *Ziziphus*, *Acer*, *Nerium*, *Anthyllis*, *Acacia*, *Eucalyptus*, *Robinia*, *Prunus*, *Morus*, *Juglans* and *Rubus*; rarely in *Ficus* and exceptionally in conifers (*Taxus*, *Pinus* and *Cupressus*).

6. ***Trichoferus holosericeus*** **(Rossi, 1790)**

Local distribution - Malta: Marsaxlokk, Mdina (Cameron & Caruana Gatto, 1907), St. Andrews (Mifsud, 1993) and Naxxar.
Material examined - Malta: Naxxar, 8.vii.2001, 1 ex., leg. A. Seguna (actinic light trap).
Global distribution - Europe, North Africa (very localised in Algeria and Morocco), Crimea, Turkey and imported (?) in Israel. Typical inhabitant of Mediterranean maquis, common only in central Mediterranean; found in Spain, France (mostly in southern areas), common and widespread in Italy (chiefly in plains), Balkans (coastal plains) up to Albania and Greece (including Crete).
Host plants - Larval development takes place under the bark and in the wood of dry trunks and branches of various broadleaf trees including *Robinia pseudacacia*, *Juglans*, *Pistacia*, *Polulus*, *Ficus carica*, *Prunus*, *Quercus*, *Ostrya carpinifolia*, *Castanea*, *Fagus* and *Ulmus*. Development also takes place in prepared timber (poles, fences, roofs, etc.) and sometimes also in furniture.

7. ***Stromatium unicolor*** **(Olivier, 1795)**

Local distribution - Malta: Buskett, Chadwick Lakes, Wied Qannotta, San Pawl tat-Targa (Schembri & Sama, 1986), Sliema, Siggiewi, Wied Babu, Wied tal-Isqof, Rabat, Marfa, Wied il-kbir, Wied tal-Bahrija, Gharghur and Zejtun. Gozo: Xaghra.
Global distribution - Central and southern Europe, North Africa, Caucasus, northern Iran, Middle East (Iraq, Jordan, Lebanon and Israel), Cyprus and Middle Asia. Imported in USA, Cuba, Brazil and Jamaica. In Europe only in Hungary and the whole of the Mediterranean Region, from the Iberian Peninsula and southern France to Crimea.
Host plants - Larval development takes place in dead dry wood of branches of various broadleaf trees including *Quercus*, *Celtis*, *Ulmus*, *Cytisus*, *Pistacia*, *Juglans*, *Fagus*, *Morus*, *Cassia*, *Ficus*, *Corylus*, *Platanus*, *Tamarix*, *Robinia*, *Prunus*, *Tilia*, *Carpinus*, *Castanea*, *Salix*, *Alnus*, *Citrus* and *Eucalyptus*; also in conifers (*Cedrus*, *Abies* and *Larix*). Development also takes place in seasoned timber, furniture, and wooden structures such as roof timbers and fences.

8. ***Phoracantha recurva*** **Newman, 1840**

Local distribution - Malta: Rabat.

Material examined - Malta: Rabat, 15.xi.2001, 1 ex., leg. P. Sammut, Rabat, 3.viii.2002, 1 ex., leg. P. Sammut.
Global distribution - Throughout the Australian continent and Papua New Guinea. Introduced in New Zealand, South Africa, California and Malawi (Wang, 1995) and more recently in the Mediterranean Region with records from Morocco (Ruiz & Barranco, 1998), Spain (Bercedo & Bahillo, 1999), Greece (Sama, G. *pers. comm.*) and now Malta.
Host plants - Larval development takes place exclusively in *Eucalyptus* trees.
Notes - New record for the Maltese Islands.

9. ***Phoracantha semipunctata*** **(Fabricius, 1775)**

Local distribution - Malta: Siggiewi, Ghammieri (Marsa), Balzan (Mifsud & Booth, 1997), Qrendi, Burmarrad, Naxxar and Rabat. Gozo: Xaghra.
Global distribution - Originally Australian, but now almost sub-cosmopolitan.
Host plants - Larval development takes place exclusively in *Eucalyptus* trees.

10. ***Penichroa fasciata*** **(Stephens, 1831)**

Local distribution - Malta: Hal-Far, Wied Babu, Sliema (Schembri & Sama, 1986), Rabat, Buskett, Naxxar, Msida, Maqluba (Qrendi), Ghammieri (Marsa) and Kalkara.
Global distribution - Europe, Caucasus, Azerbaidzhan, northern Iran, Asia Minor, Middle East including Cyprus, North Africa, occasionally imported in North America. In Europe thermophilous, occurring only in Iberian Peninsula, southern France, Italy, Balkans southward to Crete, reaching Crimea in the east (Sama, 2002).
Host plants - Larval development takes place in dead dry wood of twigs, branches and roots, and thick bark of various broadleaf trees including *Ficus*, *Quercus*, *Morus*, *Prunus*, *Ceratonia*, *Glycyrrhiza*, *Pistacia*, *Eucalyptus*, *Cercis* and *Cytisus*; occasionally also in conifers (*Pinus* and *Thuya*).

11. ***Gracilia minuta*** **(Fabricius, 1781)**

Local distribution - Malta: Buskett (Schembri & Sama, 1986), Chadwick Lakes, Marsaskala (Mifsud & Booth, 1997), Ghammieri (Marsa) and private grounds of Verdala Palace (near Buskett).
Global distribution - Probably, originally western Mediterranean, but almost cosmopolitan in distribution. Recorded from Europe, Caucasus, Asia Minor, North Africa, Canary Islands and Madeira. Imported in Japan and in North America. Common and widespread only in southern Europe, local in western, central and eastern Europe; introduced but not established in northern Europe.
Host plants - Larval development takes place under the bark of dry and thin twigs of various broadleaf trees including *Salix*, *Castanea*, *Quercus*, *Rubus*, *Ulmus*, *Ficus*, *Malus*, *Citrus*, *Acer*, *Juglans*, *Euonymus*, *Ceratonia*, *Crataegus*, *Prunus*, *Rosa*, *Corylus*, *Aesculus*, *Betula* and *Rhamnus*, often also on conifers (*Cedrus* sp., cultivated and *Pinus halepensis*).
Notes - Prior to this study, *G. minuta* (Fabricius) was known from three isolated records. More than 40 specimens were reared from a small dead branch of *Ceratonia siliqua* taken from the Verdala Palace.

12. ***Nathrius brevipennis*** **(Mulsant, 1839)**

Local distribution - Malta: Kalkara (Mifsud & Booth, 1997). Gozo: Marsalforn Valley (Mifsud, 1993) and Victoria (Mifsud & Booth, 1997).
Global distribution - Southern Europe, North Africa, Caucasus, Transcaucasia and Iran. The species was introduced in Central Europe, China, North and South America.
Host plants - Larval development takes place first under the bark and later in the wood of thin branches and twigs of various broadleaf trees including *Alnus*, *Rosa*, *Fraxinus*, *Corylus*, *Ficus*, *Castanea*, *Salix*, *Jugans*, *Quercus*, *Morus*, *Cornus*, *Ceratonia*, *Pistacia*, *Ziziphus*, *Robinia*, *Ostrya* and *Eriobotrya*, occasionally also in conifers (*Pinus* and *Cupressus*).

13. ***Stenopterus rufus rufus*** **(Linnaeus, 1767)**

Local distribution - Malta: Wied il-Kbir (Mifsud & Booth, 1997).
Global distribution - *S. rufus rufus* (Linnaeus) is known from Europe (except the northern parts), Balkans (Bulgaria), European Russia and Caucasian Region. In the east it is replaced by *Stenopterus rufus geniculatus* Kraatz, 1863 and *S. rufus syriacus* Pic, 1892.
Host plants - Larval development takes place in dead, dry wood of broadleaf trees including *Quercus*, *Castanea*, *Robinia*, *Juglans*, *Salix*, *Paliurus*, *Ostrya*, *Pistacia*, *Ulmus*, *Ficus* and *Prunus*.

14. ***Certallum ebulinum*** **(Linnaeus, 1767)**

Local distribution - Malta: Wied is-Sewda (Mifsud & Booth, 1997).
Global distribution - Iberian Peninsula, Southern France, Central-southern Italy, Greece, Turkey, Iran, Caucasus, Transcaucasia and Middle East.
Host plants - Larval development takes place in stems and roots of living herbaceous plants of the families Daucaceae, Lamiaceae and Brassicaceae (*Erysinum*, *Sisymbrium*, *Psychine*, *Raphanus* and *Raphanistrum*).

15. ***Cerambyx cerdo*** **Linnaeus, 1758**

Local distribution - Malta: Dockyard (Cameron & Caruana Gatto, 1907), Addolorata Cemetry (Schembri & Sama, 1986), Maqluba, Marsa and private ground of San Anton Gardens.
Global distribution - Europe, Caucasus, Asia Minor, northern Iran, Iraq, Israel, Palestine. Widespread in most of Europe (northward to southern Sweden, eastward to Belorussia, Ukraine, Moldavia and Crimea), but more common in the Mediterranean Region (Sama, 2002).

Host plants - Larval development takes place first under bark and later deep in the wood of sick, sun-exposed large living trunks of several species of *Quercus*. The species is also reported (probably based on occasional adaptations) from other broadleaf trees like *Juglans*, *Fraxinus*, *Castanea* and *Ceratonia*.
Notes - This species was locally known from very few records but recently more than 20 specimens were examined from Marsa. These specimens emerged from a sick cultivated *Quercus ilex* tree.

16. ***Cerambyx welensii* Küster, 1846**

Local distribution - Malta (Mifsud & Booth, 1997).
Global distribution - Europe, Southern Turkey and the Middle East (Jordan, Lebanon and Israel).
Host plants - Larval development takes place under bark and in the wood of living trunks of broadleaf trees with a special preference for *Quercus ilex* but occasionally also in *Platanus* and *Ceratonia*.

***Cerambyx miles* Bonelli, 1823**

Local distribution - Malta (Anonymous, 1890; Borg, 1922; Saliba, 1963): Marsaxlokk and Gnejna (Cameron & Caruana Gatto, 1907).
Global distribution - Europe, Asia Minor, Caucasus, Syria, Lebanon with records from Morocco which appear rather doubtful (Sama, 2002). Southern European species, in western and central Europe occurring in a few xerothermic localities: France, Switzerland (Tessin), Slovakia, Hungary. More common in southern Europe (but localised in Iberian Peninsula), and widespread from southern France, Italy, and Balkans to Crimea.
Host plants - Larval development takes place in living broadleaf trees with a special preference to *Quercus* but also in *Amygdalus*, *Prunus*, *Malus*, *Pyrus*, *Crataegus*, *Carpinus* and *Vitis*.
Notes - The species was originally recorded from the Maltese Islands in 1890 when McLachlan mentioned that a serious enemy of orange-trees in Malta was the larva of a large longhorn beetle (*Cerambyx miles*) which bores into the lower parts of the stem and down into the roots, making large galleries (Anonymous, 1890). This host plant record is very unusual for *C. miles* Bonelli. Cameron & Caruana Gatto (1907) recorded the species from Marsaxlokk and Gnejna but these records most probably refer to *C. nodulosus* Germar. Borg (1922) recorded this species as injurious to pear trees and other cultivated trees, whereas Saliba (1963) reported that *C. miles* Bonelli is locally common on apple and pear trees. Local records of *C. miles* Bonelli should be referred to *C. nodulosus* Germar.

17. ***Cerambyx nodulosus* Germar, 1817**

Local distribution - Malta: Balzan, Birkirkara (Schembri & Sama, 1986), Santa Venera, Iklin, Zejtun, around Dragonara Hotel (Paceville), Zabbar, Chadwick Lakes, Tal-Virtu (Rabat), Ghammieri (Marsa) and St. Julians.
Global distribution - East Mediterranean with records from Venezia Giulia, Istria, Dalmatia, Greece, Bulgaria, Romania, Turkey, Syria and Caucasus.
Host plants - Larval development takes place in wood of living broadleaf trees, especially in fruit-trees such as *Pyrus* and *Malus*, but also in *Crataegus* and *Acer*.
Notes - This species was originally recorded from the Maltese Islands by Caruana Gatto (1894) but in his later co-authored catalogue it was substituted by *C. miles* Bonelli (Cameron & Caruana Gatto, 1907; Schembri & Sama, 1986). The records of *Cerambyx dux* Faldermann, 1837 by Saliba (1963; 1972b; 1974a; 1977) should refer to this species. This Eastern element is thought to have been accidentally introduced in the Maltese Islands (Sama, 1988) were it is now a well established pest of stone fruit-trees.

18. ***Cerambyx carinatus* Küster, 1846**

Local distribution - Malta: Balzan (Mifsud & Booth, 1997) and Rabat.
Material examined - Malta: Rabat, 21.vi.2002, 1 ex., leg. P. Sammut, Rabat, 23.vi.2002, 1 ex., leg. P. Sammut, Rabat, 1.vii.2002, 1 ex., leg. P. Sammut.
Global distribution - Balkan Peninsula (southward to Greece), Turkey and Malta.
Host plants - Larval development takes place in sick wood of trunks of *Prunus* spp.
Notes - Besides the material cited above, an old specimen (?) (Sammut, P. *pers. comm.*) labelled 'Malta' was also found in the collections of the Natural History Museum of Mdina, indicating that this species may have been introduced earlier than the first records indicated by Mifsud & Booth (1997). This introduced species seems to be locally established.

***Cerambyx scopolii* Füsslins, 1775**

Local distribution - Malta (Saliba, 1963).
Global distribution - Europe, Asia Minor and Caucasus. In Europe the species is very common from southern Scandinavia (Norway and Sweden) to Sicily and Crete and from Portugal to Russia and Crimea. In North Africa (Algeria and Tunisia), *C. scopolii* Füsslins is replaced by *C. paludivagus* Lucas, 1846.
Host plants - Larval development takes place first under bark and later in wood of dead branches and trunks of broadleaf trees including *Juglans*, *Quercus*, *Prunus*, *Fagus*, *Castanea*, *Carpinus*, *Betula*, *Ulmus*, *Salix*, *Populus*, *Syringa*, *Tilia*, *Corylus* and *Ostrya*.
Notes - This species was only recorded by Saliba (1963) as uncommon on vines and the record is most likely incorrect.

***19. Hylotrupes bajulus* (Linnaeus, 1758)**

Local distribution - Malta: Dockyard (Cameron & Caruana Gatto, 1907), Tigne, Gzira, Marsa (Schembri & Sama, 1986), Sliema, Qrendi and Zejtun.
Global distribution - Europe, North Africa, Canary Islands, Madeira, Asia Minor, Middle East, Northern Iran,

Caucasus, Siberia and China. Imported in North America, South Africa, Madagascar and Asia.
Host plants - Larval development takes place in the dead dry wood of stems and stumps of conifers (*Picea*, *Pinus* and *Abies*). The species is common in Europe were it develops in wooden buildings made with conifer timber.

***Ropalopus clavipes* (Fabricius, 1775)**

Local distribution - Malta (Cameron & Caruana Gatto, 1907).
Global distribution - Europe, Caucasus, Asia Minor, Middle East and Siberia. Sporadic in central Europe (northward to Denmark according to old records) and most common in south-eastern Europe.
Host plants - Larval development takes place in dead twigs and small branches of trees and bushes of various broadleaf trees including *Acer*, *Alnus*, *Castanea*, *Fagus*, *Quercus*, *Corylus*, *Salix*, *Malus*, *Prunus*, *Tilia*, *Rhamnus*, *Ulmus*, *Juglans*, *Paliurus*, *Pistacia* and *Populus*; occasionally it can also develop in conifers (*Picea excelsa* and *Abies cilicica*).
Notes - The record of *R. clavipes* (Fabricius) by Cameron & Caruana Gatto (1907) is in need of verification, since the southernmost European station of this taxon is peninsular Italy. The Maltese record could be attributed to an accidental introduction. The possibility of a misidentification with other *Ropalopus* species is also remote. Most *Ropalopus* species have distributions in Central Europe or adjacent regions with the exception of two species, *R. siculus* (Stierlin, 1864) and *R. insubricus* (Germar, 1824), both with larval development generally taking place in *Acer* spp., a host plant which is locally lacking.

20. ***Chlorophorus glabromaculatus* (Goeze, 1777)**

Local distribution - Malta: Birkirkara (Schembri & Sama, 1986), Buskett, Ghajn Rihana, Wied Has-Sabtan and Sliema.
Global distribution - Europe with records from France (except south-western provinces), Italy (including Sardinia and Sicily), Switzerland, Belgium, Germany (introduced) and north-western Balkans (mostly in coastal regions).
Host plants - Larval development takes place in dead dry wood of broadleaf trees including *Quercus*, *Castanea*, *Robinia*, *Vitis*, *Prunus*, *Acer*, *Ulmus*, *Populus*, *Salix*, *Alnus*, *Zelkova crenata* and others; only occasionally in conifers (*Juniperus*).
Notes - Prior to this study, *C. glabromaculatus* (Goeze) was locally known from two single records (Schembri & Sama, 1986). More than 20 specimens were reared from dead branches of *Quercus* taken from Buskett. In Italy the species is known from all regions but unlike Malta, it seems to be more rare and sporadic in the south and on the islands (Sama, 1988).

21. ***Chlorophorus varius* (Müller, 1766)**

Local distribution - Malta: Buskett (Cameron & Caruana Gatto, 1907), Wied Incita, Wied Qannotta (Schembri & Sama, 1986), Bahrija and Gnejna.
Global distribution - Central and Southern Europe (sporadic in Central Europe), Asia Minor, Northern Iran, Turkestan and Western Siberia.
Host plants - Larval development takes place in the wood of exposed twigs and branches of broadleaf trees including *Vitis*, *Acer*, *Quercus*, *Populus*, *Malus*, *Crataegus*, *Juglans*, *Robinia*, *Elaeagnus*, *Ficus*, *Sesbania*, *Prunus*, *Pyrus*, *Morus*, *Castanea*, *Ulmus*, *Alnus*, *Fraxinus*, *Pistacia*, *Paliurus*, *Salicornia* and *Spartium*.

22. ***Parmena* sp.**

Local distribution - Malta: Marsaskala (Cameron & Caruana Gatto, 1907), Buskett, Ghajn Hadid, Delimara, Qawra Point, White Tower Bay (Schembri & Sama, 1986), Golden Bay, Armier, Ghajn Rihana, Hagar Qim, Qrendi, Rabat, Bahrija, Wied is-Sewda, Wied il-Kbir and Zejtun. Gozo: Ta' Pinu, Sannat (Schembri & Sama, 1986), Ghasri, Dwejra, Marsalforn and Qbajjar. Comino: Santa Maria and near Tower (Schembri & Sama, 1986).
Global distribution - Malta (?).
Host plants - Within the *pubescens/algirica* group (refer to comments hereunder), larval development has been reported to occur in stalks, roots and twigs of herbaceous plants including *Euphorbia*, *Crithmum*, *Foeniculum*, *Ferula*, *Thapsia*, *Amni*, *Chrysanthemum*, *Papaver* and Carduaceae, only occasionally in *Ficus* and *Nerium*.
Notes - This species was recorded as *Parmena pubescens* (Dalman, 1817) by Schembri & Sama (1986). Sama (1988) included the Maltese species in the nominotypical subspecies, stating however that the specimens from the Pelagic and the Maltese Islands could be separated as a distinct taxon. The exact taxonomic status of the Maltese *Parmena*, which belong to the *pubescens/algirica* group, remains to be clarified. They could belong to a new species or to a form of *P. algirica* Castelnau, 1840 (G. Sama, personal communication).

23. ***Phryneta leprosa* (Fabricius, 1775)**

Local distribution - Malta: Wied tal-Isqof, Hemsija, Mdina, Tal-Virtu, Ghammieri (Marsa) and Mosta (Mifsud & Dandria, 2002).
Global distribution - From Sierra Leone to Angola and Tanzania (Breuning, 1937; Adlbauer & Mourglia, 1999).
Host plants - Larval development takes place in the wood of living trunks of several broadleaf trees. In Malta, *P. leprosa* (Fabricius) was only reported as developing in thick trunks of *Morus nigra* (Mifsud & Dandria, 2002).
Notes - This species was presumably accidentally introduced in Malta in 1998. It is locally naturalised and is causing considerable damage to *Morus nigra* trees (Mifsud & Dandria, 2002).

***24. Niphona picticornis* Mulsant, 1839**

Local distribution - Malta: Marsaskala (Cameron & Caruana Gatto, 1907), Birkirkara, Wied il-Ghasel, Buskett,

Wied Qirda, Sliema (Schembri & Sama, 1986), St. Julians, Dingli, Mistra, Mellieha, Wied Babu, Delimara, Zejtun, Ghajn Tuffieha, Fomm ir-Rih and Rabat. Gozo: Ramla.
Global distribution - Throughout the Mediterranean Region.
Host plants - Larval development takes place in dead branches and stems of broadleaf trees including *Ficus*, *Spartium*, *Pistacia*, *Robinia*, *Castanea*, *Ulmus*, *Punica*, *Morus*, *Prunus*, *Quercus*, *Calycotome*, *Sambucus*, *Laurus*, *Cercis*, *Euphorbia*, *Rhamnus*, *Phoenix* and *Genista*; occasionally in conifers (*Pinus*).

25. ***Deroplia troberti* (Mulsant, 1843)**

Local distribution - Malta: Buskett (Schembri & Sama, 1986; Mifsud & Booth, 1997) and Wied Qannotta.
Material examined - Malta: Wied Qannotta, 20.iii.1988, 4 exs., leg. A. Seguna (actinic light trap).
Global distribution - Europe and North Africa. In southern Europe the species is mostly found along the coastal plains of Portugal, Spain, Southern France (including Corsica), western and southern Italy (including Sardinia and Sicily), Croatia, Bosnia-Herzegovina and Greece (including Crete: *D. troberti cruciata* Sama, 1997).
Host plants - Larval development takes place in dead and dying twigs of broadleaf trees including *Quercus* spp., *Nerium oleander*, *Pistacia lentiscus*, *Laurus nobilis* and *Juglans regia*.
Notes - Prior to this study, *D. troberti* (Mulsant) was known from two isolated records, both taken from Buskett.

26. ***Saperda punctata* (Linnaeus, 1767)**

Local distribution - Malta: Valletta (Cameron & Caruana Gatto, 1907).
Global distribution - Europe, North Africa (Algeria), Asia Minor and Caucasus. In central Europe the species is sporadic but widely distributed; in southern and south-eastern Europe the species is known from northern Spain and Italy to Balkans, Moldavia, Crimea, Ukraine and European Russia (Sama, 2002).
Host plants - Larval development takes place under bark of sick and dying stems and branches of *Ulmus*; only occasionally in *Quercus* and *Tilia*.
Notes - *S. punctata* (Linnaeus) is a relatively rare species in the southern Mediterranean Region; it is very rare in Sicily where it was found only recently, following old citations (Sama, G. *pers. comm.*). The record by Cameron & Caruana Gatto (1907) should be correct. The fact that the species was never found recently may be due to extinction, following extensive habitat degradation and persecution of indigenous *Ulmus* trees (Lanfranco, 1989).

***Oberea* (*Amaurostoma*) *erythrocephala* (Schrank, 1776)**

Local distribution - Malta (Reiche, 1877).
Global distribution - Europe, North Africa (Morocco), Asia Minor, Caucasus, Transcaucasia, northern Iran, Middle East, southern Urals, northern Kazakhstan. Sporadic (thermophilous) in Poland, Belorussia and southern Urals; locally common in France, Switzerland, Germany, south-eastern Austria and Hungary; widespread but uncommon and strongly localized in Iberian Peninsula (southward to Cadiz) and Italy (apparently absent south of Latium); rather common in Balkans (reaching northern Greece) eastward to southern part of European Russia and European Kazakhstan (Sama, 2002).
Host plants - Larval development takes place in the central stalks towards the roots of several *Euphorbia*, especially *E. characias*, *E. cyparissias*, *E. esula* and *E. seguieriana*.
Notes - Reiche (1877) described *Oberea melitana* Reiche from material presumably collected from Malta. This taxon was later included as a variety of *Oberea erythrocephala* (Schrank). This record is in need of verification because what was locally collected (if really in Malta) could have been a different species of *Oberea*.

27. ***Calamobius filum* (Rossi, 1790)**

Local distribution - Malta: Ta' Baldu, Girgenti, Imtahleb (Cameron & Caruana Gatto, 1907), Wied Qirda (Schembri & Sama, 1986), Mgiebah, Bahrija and Zejtun.
Global distribution - Europe, North Africa, Asia Minor, Caucasus, Transcaucasia, northern Iran, Middle East, Cyprus. Widely distributed in southern parts of Europe from Spain and France to Austria, Czechia, Slovakia, Ukraine and southern part of European Russia (Sama, 2002).
Host plants - Larval development takes place in living stems of Poaceae: *Arrhenaterum elatius*, *Calamogrostis pseudophragmites*, *Dactylis glomerata*, *Hedysarum*, *Hordeum* and *Triticum*.

28. ***Agapanthia asphodeli* (Latreille, 1804)**

Local distribution - Malta: Hamrun, Wied il-Ghasel, Wied Qannotta (Schembri & Sama, 1986), Wied Has-Sabtan, Pellegrin, Gharghur, Mosta, Wardija, Wied iz-Zurrieq, Maqluba, Buskett, Mistra and Ghar Lapsi.
Global distribution - North Africa, Iberian Peninsula, France, Switzerland, Italy, Balkans, Turkey, Syria and Caucasus.
Host plants - Larval development takes place in the stalks of herbaceous plants with a special preference for *Asphodelus* but also in *Thapsia*, *Ferula* and in Carduaceae.

***Agapanthia cynarae cynarae* (Germar, 1817)**

Local distribution - Malta: Fort Manuel and Corradino (Cameron & Caruana Gatto, 1907).
Global distribution - Europe. In southern and south-eastern Europe known from north-eastern and south-eastern Italy, Balkans (from Istria to Peloponnese and European Turkey) and Crete (described as a separate subspecies: *A. cynarae michaeli* Sláma, 1986).
Host plants - Larval development takes place primarily in the stalks of Asteraceae with a preference for *Onopordon* but also in *Carduus pycnocephalus*, *Cirsium*, *Aconitum* and *Acanthus*.

Notes - Most likely, the record of this species by Caruana Gatto (1894) and Cameron & Caruana Gatto (1907) is erroneous. The species is not even known from Sicily and according to Sama (1988) an old citation of this species for Sicily should refer to either *A. villosoviridescens* (DeGeer, 1775) or *A. maculicornis* (Gyllenhal, 1817).

29. ***Agapanthia cardui* (Linnaeus, 1758) (s. l.)**

Local distribution - Malta: Imtahleb (Cameron & Caruana Gatto, 1907), Ghadira, Gwardamangia, Wied Qirda, Birkirkara, Wied is-Sewda (Schembri & Sama, 1986), Wied Has-Sabtan, Zejtun, Tal-Munxar (St. Thomas Bay), Rabat, Buskett, Maqluba and Bahrija.
Global distribution - Central and southern Europe, with records from western France to Poland, Ukraine, and eastward to southern Urals, northern and central areas of Spain, Italy, Balkans and southward to Greece; southern parts of Mediterranean peninsulas, Sicily and Andalusia, North Africa and Middle East.
Host plants - Larval development takes place in the stalks of herbaceous plants including *Urtica*, *Cirsium*, *Scolymus*, *Carduus*, *Melilotus*, *Heracleum*, *Senecio*, *Eupatorium*, *Chrysanthemum*, *Dipsacus*, *Pyrethrum*, *Valeriana*, *Salvia* and others.
Notes - In the southernmost part of its distributional range, *A. cardui* (Linnaeus) is a very variable species with two main phenotypes; a northern one, delimited by a distribution from central and southern Europe up to Greece (refer to global distribution above) and a southern one, mainly delimited by the rest (southern parts of Mediterranean peninsulas to Middle East) of the distributional range provided above. Larval morphology fully supports the separation of these two forms into two species, which confirms recent studies on shape of aedeagus and endophallic sclerites (Sama, 2002).

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NOTE ON THE DIET OF A GREY LONG-EARED BAT, *PLECOTUS AUSTRIACUS* (FISCHER, 1829) FROM MDINA, MALTA (CHIROPTERA, VESPERTILIONIDAE)

John J. Borg[1] and Paul M. Sammut[2]

ABSTRACT

The diet of a Grey Long-eared Bat, *Plecotus austriacus*, residing in a small room at the National Museum of Natural History in Mdina was analysed seasonally (spring and autumn) during a two-year period (2000-2001). Twenty-three species of moth were identified in the bat's prey remains.

The chiropterofauna of the Maltese Islands consists of eleven species, five of which are resident while the other six are rare migrants/visitors. The Grey Long-eared Bat *Plecotus austriacus* (Fig. 1) is a resident species that has been recorded from Malta, Gozo and Comino (Borg *et al.* 1997).

This bat usually feeds by gleaning insects off leaves or the ground or catching them in the air. Schober & Grimmberger (1989) list moths, flies and small beetles as this bat's diet. Individual bats establish preferred feeding perches and one bat, which has been noted roosting in a small room at the Natural History Museum in Mdina, has made the wooden beams located in the secondary stairway its favourite perch. Bats eat the fleshy parts of their prey and the wings and hard skin are usually discarded. While the bat is eating, the discarded insect wings drop down to the floor below.

Every morning during two two-month periods (April-May and September-October 2000-2001) the discarded wings were collected from the ground and were later identified by one of the authors' (P.M.S.). During a number of observations at night, the bat was seen catching moths either in flight near to hanging lamps, or from near a *Pittisporum tobira* tree, all located in the inner courtyard of the building. As soon as the prey was caught, the bat would fly directly towards its perch and slowly dismember and devour the prey.

The lepidopterofauna of the Maltese Islands consists of about 600 species of butterflies and moths (Sammut 2000). From the prey remains collected, 23 different species of moths were identified. All these are common or very common, except for one species *Mythimna languida* which is considered as rare (Sammut 2000). The period when the moths were collected corresponded to their peak-flying season. The identified taxa, including status and season when collected are presented in Table 1 overleaf.

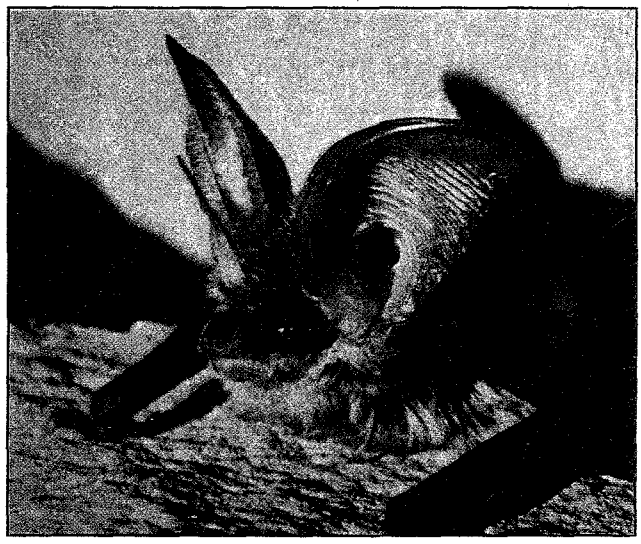

photo John J. Borg

Fig. 1 *Plecotus austriacus*

It is a known fact that bats consume large quantities of insect pests (Hill & Smith 1984). Insectivorous bats such as the Grey Long-eared Bat are highly important and beneficial taxa in the ecosystem, in the role they play by keeping down the number of insect pests. A number of pest species were identified from the sample analysed including *Galleria mellonella* a scourge in apiculture where it mines hives and bores into wooden cases. Many of the other species including *A.gamma*, *C. chalcites*, *H. peltigera*, *S. exigua* and *S. littoralis*, *N. pronuba* and the 3 *Agrotis* spp., are known pests on a variety of wild and cultivated plants.

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Table 1. Seasonal variation and percentage of prey.

Family	Species	Status*	Autumn sample	Spring sample
PYRALIDAE	*Galleria mellonella* (Linnaeus, 1758)	C	x	
	Ulotricha egregialis (Herrich-Schäffer, 1838)	C		x
SPHINGIDAE	*Hyles sammuti* Eitschberger, Danner & Surholt, 1998	C		x
	Hyles livornica (Esper, 1779)	C		x
	Hippotion celerio (Linnaeus, 1758)	C		x
NOCTUIDAE	*Autographa gamma* (Linnaeus, 1758)	VC	x	x
	Chrysodeixis chalcites (Esper, 1789)	VC	x	
	Trichoplusia ni (Hübner, 1803)	VC		x
	Abrostola trigemina (Werneburg, 1864)	C		x
	Heliothis peltigera (Denis & Schiffermüller, 1775)	VC		x
	Paradrina clavipalpis (Scopoli, 1763)	C	x	x
	Hoplodrina ambigua (Denis & Schiffermüller, 1775)	C		x
	Spodoptera exigua (Hübner, 1808)	VC	x	
	Spodoptera littoralis (Boisduval, 1833)	C		x
	Discestra trifolii (Hufnagel, 1766)	C	x	
	Aeteria bicolorata (Hufnagel, 1766)	C		x
	Mythimna languida (Walker, 1858)	R	x	
	Mythimna unipuncta (Haworth, 1809)	VC		x
	Noctua pronuba Linnaeus, 1758	VC		x
	Peridroma saucia (Hübner, 1808)	C		x
	Agrotis puta (Hübner, 1803)	VC		x
	Agrotis ipsilon (Hufnagel, 1766)	VC	x	
	Agrotis segetum (Denis & Schiffermüller, 1775)	VC	x	

* after Sammut (2000); VC – very common; C – common; R – rare.

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FIRST RECORD OF SPIDER POISONING IN THE MALTESE ISLANDS

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ABSTRACT

The first case of spider poisoning in the Maltese Islands, by *Loxosceles rufescens* (Family Sicariidae) is reported. A juvenile of the species caused a serious lesion, as well as systemic symptoms, in a male subject following a bite inflicted while the victim was asleep. The worldwide involvement of the genus *Loxosceles* in cases of envenomation, the status of *L. rufescens* in Europe and in the Maltese Islands and the victim's medical history following the bite are reviewed.

INTRODUCTION

The largely synanthropic genus *Loxosceles* now forms part of the Family Sicariidae, having previously been included in the Scytodidae and in the Loxoscelidae. The latter is now considered a junior synonym of the Sicariidae. The Sicariidae comprises just two genera: *Loxosceles* with 100 species and *Sicarius* with 21 species (Platnick, 2002).

Loxosceles has the notorious reputation of being the culprit in numerous cases of spider bite poisoning, especially in North and South America. In the United States, reports of severe envenomations by *Loxoseceles* spp., known colloqually as brown spiders, date back to the late 1800s, and today brown spiders continue to be of significant clinical concern in some regions. Of the 13 *Loxosceles* species found in the United States, at least five have been associated with necrotic arachnidism. *Loxosceles reclusa* Gertsch & Mulaik 1940, the brown recluse spider, is the species most commonly responsible for this condition (Arnold, 2002).

Throughout South America, cases of poisonous bites inflicted by *Loxosceles* spp. are also very common and widespread. In Brazil, *Loxosceles* spp. are the most poisonous spiders present and children who develop the more severe systemic effects after envenomation nearly always die. At least three different *Loxosceles* species of medical importance are known: *L. intermedia* Mello-Leitão 1934, *L. laeta* (Nicolet 1849) and *L. gaucho* Gertsch 1967. More than 1500 cases of envenomation by *L. intermedia* alone are reported each year (Goncalves de Andrade et al., 2000).

L. rufescens is considered to be a cosmopolitan species, although it has not been recorded yet from either Central or Northern Europe. It is widely distributed in the Mediterranean region, and its range also includes Oceania, Japan, Malaysia, the USA, Mexico and Bermuda. (Kritscher, 1996). Brignoli (1969) records it from mainland Italy, Sicily, Sardinia, and the Aeolian, Egadi and other circum-Italian islands. In the same work he states that, in spite of the relative frequency of the spider, no cases of *Loxosceles* poisoning were known from Italian territory. He is of the opinion that this is more likely due to the habits of these spiders rather than to the fact that their bite is non-poisonous. Verneau (2002) indicates that no cases of *Loxosceles rufescens* poisoning have been recorded from Corsica. Sauer & Wunderlich (1997), in their work on European spiders, state that no such cases are known, presumably from Europe.

As a result of the work of Cantarella (1982), Baldacchino *et al.* (1993), Bosmans & Dandria (1993) and Kritscher (1996), 140 araneid species distributed in 29 families have been recorded from the Maltese Islands. None of these authors cite any species considered to have a bite dangerous to humans, with the exception of Baldacchino *et al.* (1993) who refer to the reputation of the bite of the theridiid species *Steatoda paykulliana* (Walckenaer, 1806) as being poisonous to humans (as reported by Jones, 1983), but point out that they were not aware of any cases of such bites having occurred in the Maltese Islands.

Loxosceles rufescens (Dufour, 1820) is the only species of the genus recorded by Baldacchino *et al.* (1993) and by Kritscher (1996). The latter author collected both males and females from eleven localities in Malta and five in Gozo. He indicates dry shady places as the preferred habitat and states that there is wide variation within the species. Practically all his specimens were found under stones in rural areas; on one occasion two males and two females were collected in "Mosta, town zone, in houses or on ground nearby". One of the present authors (DD) has

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collected specimens of *L. rufescens* from abandoned buildings in the countryside. It is safe to say, therefore, that the occurrence of *L. rufescens* inside houses is, to say the least, very infrequent.

CASE HISTORY

On 13th July 2002 a thirty five-year-old Maltese male with no particular previous history of strong atopic reactions presented himself at the clinic of one of the authors (PM). He gave a history of being awoken the previous night by a sudden sharp stinging pain in his right abdominal flank. He managed to notice what might have been a spider scuttling away, and hence assumed it to be responsible for his injury. He also managed to hit the spider (which was later retrieved and eventually identified as a juvenile *Loxosceles rufescens*).

He initially had absolutely no symptoms and just went back to sleep. The following morning he was equally asymptomatic except for a very localised tender spot over the assumed bite area. However, within 3-4 hours of waking he had developed the following symptoms:

Systemically: chills, malaise, diffuse muscle pain, low grade fever, nausea.
Topically: increasing pain, local tenderness and induration (hardening of the tissues) and a groin lump on the same side as the bite.

On examination, he was found to be feverish, had no systemic rash but locally showed a 2-4 mm haematomatous lesion on his right lower flank surrounded by a 5-7 cm indurated area of subcutaneous inflammation, with a very clear inflammation of the lymphatic vessels leading down to swollen lymph node in the groin. Here there was one very tender inflamed 2 cm node & 2 other shotty ones. There were no signs of petechiae, the reddish or purple spots containing blood which are associated with infectious diseases, locally or otherwise. There were no signs of systemic haematological disorder and no other similar lesions, or any other glandular abnormality for that matter. No other household member had any record of any similar bites.

The treatment administered involved a systemic steroid shot, plus an oral antibiotic and antihistamine. Following this regime the patient improved immediately, but developed recurrent localised severe pain and lymphatic inflammation on the 17th and 18th July. He was referred to a dermatologist on the 18th, but put off going.

On 21st July he was seen at the Emergency & Accident Department of a general hospital, where the lesion was excised, and a sample taken for histological investigations, the results of which indicated epithelial necrosis and spongiosis (localised swelling) of the epidermis, associated with some petechial bleeding and ulceration. He was started on another broad-spectrum antibiotic and discharged. The next day the patient was again examined by P.M. as he was still very much in pain. His dressing was changed and he was advised to start some more potent analgesia. At this point the causative organism which had been referred to one of the present authors (D.D.) was identified as *Loxosceles rufescens* and in view of the reputation of species of *Loxosceles*, concern increased about the potential necrotic effects of the toxin involved and hence, poor healing of the excision. The victim was therefore referred to a plastic surgeon.

Clinical examination by the latter revealed an ulcer measuring 1 cm in diameter on the right hip with a surrounding 3 - 4 cm area of induration with little redness. Slough (necrotic tissue) was present in the base of the wound. Surgical removal of devitalised tissue in the area was performed under local anaesthetic on 26th July. The skin ulcer was excised together with an extensive area of the surrounding subcutaneous fat that appeared to have undergone necrosis (this corresponded to the area of induration present on examination). The resulting wound was closed directly by means of polydioxanone sutures (an absorbable material that allowed the stitches to be buried, giving a better cosmetic result). Follow up on 5th August showed that the surgical wound had healed well with no evidence of infection. (Joseph E.. Briffa, pers. comm.).

DISCUSSION

The following account of the characteristics and effects of the North American species *L. reclusa* is based on Arnold (2002). The venom comprises at least 8 components, including enzymes such as hyaluronidase, deoxyribonuclease, ribonuclease, alkaline phosphatase, and lipase. Sphingomyelinase D is thought to be the protein component responsible for most of the tissue destruction and haemolysis caused by brown recluse spider envenomation. These and other factors contribute to the local and systemic reactions of necrotic arachnidism. The venom of juvenile and adult spiders is equally potent.

Bites elicit minimal initial sensation and are frequently disregarded until several hours later when the pain intensifies.An initial stinging sensation is replaced over 6-8 hours by severe pain and itching, as local blood-vessel contraction causes the tissue to become anaemic.

Symptoms of systemic loxoscelism, which is uncommon and occurs more frequently in children than in adults, are not related to the extent of local tissue reaction and include the following: measle-like rash, fever, chills, nausea, vomiting, joint pains, haemolysis, disseminated intravascular coagulation (DIC), renal failure, seizures and coma.

Cutaneous symptoms include: swelling around the bite giving the appearance of a reddish halo round the lesion; this continues to enlarge as the venom spreads into the surrounding tissue. After 24 – 72 hours the reddish halo around the site continues to enlarge. Typically, at 24-72 hours, a single clear or bleeding vesicle develops at the site, which

later forms a dark eschar or scab. Necrosis is more significant in the fatty areas of the buttocks, thighs, and abdominal wall. In the case under present review, the systemic symptoms which appeared soon after the patient was bitten were relatively mild. The cutaneous reaction was however quite severe and compares well with that described by Arnold (2002) for *L. reclusa* bites in North America. This indicates that the local species, *L. rufescens*, also posesses a potent venom with similar necrotic and haemolytic characteristics as that of *L. reclusa*.

The greater incidence of loxoscelism in the Americas is in all probability due to the strongly synanthropic habits of the New World species. *L. reclusa*, for example, although naturally non-aggressive toward humans, lives in undisturbed attics, woodpiles, and storage sheds, almost always in close proximity to man. Most bites take place when the sleeping victim unwittingly makes contact with a spider which is crawling over the bedclothes. This is what probably happened in the case under review. The European species, however, is very rarely observed in human habitations, and this would account for the fact that hitherto no cases of loxoscelism have apparently been reported in Europe. The occurrence of this case, therefore, should be treated as accidental, and should not give rise to any fears of a greater incidence of such bites in future.

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PRESENT DISTRIBUTION OF THE THREATENED KILLIFISH *APHANIUS FASCIATUS* (ACTINOPTERYGII, CYPRINODONTIDAE) IN THE MALTESE ISLANDS.

Alan Deidun[1], Isabella Arcidiacono[2], Concetta Tigano[2] and Patrick J. Schembri[1,3]

ABSTRACT

A survey of the nine localities from which the threatened Killifish *Aphanius fasciatus* has been recorded in the Maltese Islands showed that large and thriving populations exist at Salina, at the Simar and Ghadira bird sanctuaries and in reservoirs at Marsa and Ghadira. The Simar and Ghadira populations are introduced and originate from a mixture of animals collected from Salina and Marsa. The provenance of the Marsa population is unknown but it is possibly autochthonous to the Marsa area. The Salina and possibly the Marsa populations seem to be the only remaining natural populations of this species in the Maltese Islands.

INTRODUCTION

The killifish *Aphanius fasciatus* Nardo 1827 is a small euryhaline fish distributed round most of the Mediterranean coastline except for the Iberian, Algerian and Moroccan coasts, where it is replaced by *Aphanius iberus*, and for the extreme southeastern coasts of the Levantine Sea where it is replaced by *Aphanius dispar* (Tortonese, 1986), which may or may not be a Lessepsian immigrant (Kornfield & Nevo, 1976) (Fig.1). *Aphanius fasciatus* is considered to be threatened throughout its range and is listed in Appendices II (Strictly protected fauna species) and III (Protected fauna species) of the Bern Convention (Convention on the Conservation of European Wildlife and Natural Habitats), and in Annex II (Animal and plant species of community interest whose conservation requires the designation of special areas of conservation) of the Habitats Directive (Council Directive 92/43/EEC (1) of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora as amended by Council Directive 97/62/EC of 27 October 1997) of the European Union. In spite of its protected status, some populations have declined, for example those of eastern Sicily (Ferrito & Tigano, 1995; 1996).

Aphanius fasciatus is native to the Maltese Islands where it has been reported by Gulia (1858-59) from running water and from the sea close to sources of freshwater, and by Despott (1919) and Lanfranco (1958) from brackish and hypersaline waters. More recently it has been recorded by Closs & Zammit (1973), Zammit (1975), Zammit & Van Es (1980) and Cilia (1986), and it is included in recent checklists of Maltese fishes (Lanfranco, 1993; Farrugia Randon & Sammut, 1999; Sammut, 2001 and Farrugia Randon, 2001). It has been suggested (Darmanin, 1979) that local populations of this species present phenotypic differences from mainland populations while different localities in the Maltese Islands have different ecotypes (Zammit & Van Es, 1980). This species is listed as 'vulnerable' in the Red Data Book for the Maltese Islands (Schembri & Sultana, 1989) and local populations have been legally protected under the Flora and Fauna Protection Regulations since 1993 (Legal Notice 49 of 1993 as amended by Legal Notice 161 of 1999).

Reviewing all the published records of *Aphanius fasciatus* from the Maltese Islands, it results that this fish is known from the following localities: Kalafrana, St. Georges Bay (Birzebbuga), Marsaxlokk, Marsascala, Marsa, Salina, Simar, and Ghadira, all on the island of Malta, and from Il-Qawra on the island of Gozo. However, it is not know if the species still occurs in these localities and what the condition of the various populations is. Obviously, given its status as a threatened and protected animal both locally and internationally, such information is of key importance for conservation and management of the species. For this reason we undertook a systematic survey of the localities where *Aphanius fasciatus* has been reported with the aim of confirming that these fish still occur and to assess the status of the populations.

METHODS

Surveys were made in March-August 2002 as during the summer months the fish come to the surface to reproduce and are therefore more easily spotted. The localities listed

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above were visited and bodies of water likely to support fish were investigated. If fish were spotted, an attempt to estimate relative population size was made by standardised sampling using hand nets with 1mm mesh. For this, two workers approached the fish from opposite ends of the water body shepherding the fish before them into shallow water and collecting them by making a known number of sweeps of the net. At each locality, the general observations on the population and its situation were also made.

RESULTS AND DISCUSSION

Fish were found at only four of the localities investigated; no fish were found at Kalafrana, St. Georges Bay, Marsaxlokk, Marsascala and Il-Qawra (Gozo).

There are presently no brackish water bodies in the Kalafrana/St.Georges Bay area and no fish were spotted in the shallow water close to shore. The only likely habitat for *Aphanius fasciatus* in the area is the mouth of Wied Zembaq where there was previously a saline marshland; however, the area is now developed and only vestiges of the marsh remain, in the form of sparse halophytic vegetation. The only suitable habitats for *Aphanius fasciatus* at Marsaxlokk are the brackish water pools at Il-Ballut. Originally this was a saline marshland that was partially converted into ponds for keeping live fish caught at sea by fishers; these ponds were abandoned for many decades and the marsh all but disappeared, however, in the late 1980s the saline marshland habitat was reconstructed by the Government in partnership with a local non-governmental organization (Bonello, 1992). Although pools with brackish to hypersaline water are now present at Il-Ballut, there are no fish there, either surviving naturally or introduced. At Marsascala, *Aphanius fasciatus* used to occur in the fish-ponds at Il-Maghluq and at the very head of the bay where the Il-Maghluq ponds connected with the sea (PJS, personal observations). During the present surveys, no fish were found in the ponds themselves or in the shallow water close to the shore at the head of the bay.

According to information provided to Cilia (1986), the population at Il-Qawra, Gozo was introduced by aquarists but no specific sites are given. The likely habitats for this species in the Il-Qawra area are the permanent freshwater pool at Il-Qattara, and the so-called 'Inland Sea', which is connected to the open sea via a tunnel-cave and where the salinity is fully marine. The Il-Qattara pool is deep and turbid and difficult to investigate, however, there was no trace of killifish in the pool during any of four separate visits made in March, April and August. Neither were there any Killifish in the 'Inland Sea'.

Aphanius fasciatus was found at Marsa, Salina, Simar, and Ghadira. At Marsa, fish used to occur in the canal which connects the low-lying land at Ta' Ceppuna, where the Marsa Sports Grounds are situated, to the sea at Marsa Creek (Closs & Zammit, 1973; Zammit & Van Es, 1980; A.E. Baldacchino, personal communication) and also in the inner harbour itself (Zammit & Van Es, 1980). No killifish at all were found in the Marsa canal during the present survey. Indeed, when the canal was visited (in August), water was present only at the seawards end of the canal, and from the main thoroughfare inland as far as the Marsa Sports Ground, the canal was dry. The inundated region of the canal supported a very large population of grey mullet (*Mugil cephalus*), numbering in the thousands and including fish up to 20cm long, but no killifish were present. No fish appeared to be present in the inner harbour, although no sampling to ascertain this was made.

A small population of *Aphanius fasciatus* was however located in a freshwater reservoir used for irrigation purposes in the Marsa Sports Grounds. It is not known if this population derives from the one that originally inhabited the Marsa canal. This reservoir has an estimated volume of *ca* 100m^3 and has had killifish living in it at least for the past 50 years (Joseph Debono, personal communication). When this reservoir was visited in August, 'domestic' goldfish were also present in thereservoir. It is not known if the *Aphanius fasciatus* population in this reservoir derives from the one that originally inhabited the Marsa canal but there are indications that the reservoir overflows into the Marsa canal and therefore it is possible that this reservoir acts as a refuge for killifish during the dry season, when the canal is dry, and that the fish recolonise the canal during the wet

Table 1 Population estimates for *Aphanius fasciatus* from different localities in the Maltese Islands.

Locality	Population estimate by hand net collecting		Visual estimate
	No. collected/ No. of hand-net strokes	Catch per unit effort	
Marsa reservoir	-	-	Low hundreds
Salina	32/15	2.13	Many hundreds
Simar	9/35	0.26	Unable to determine due to dense reed beds
Ghadira Bird Sanctuary	37/25	1.48	Many thousands
Ghadira reservoir	-	-	Low hundreds

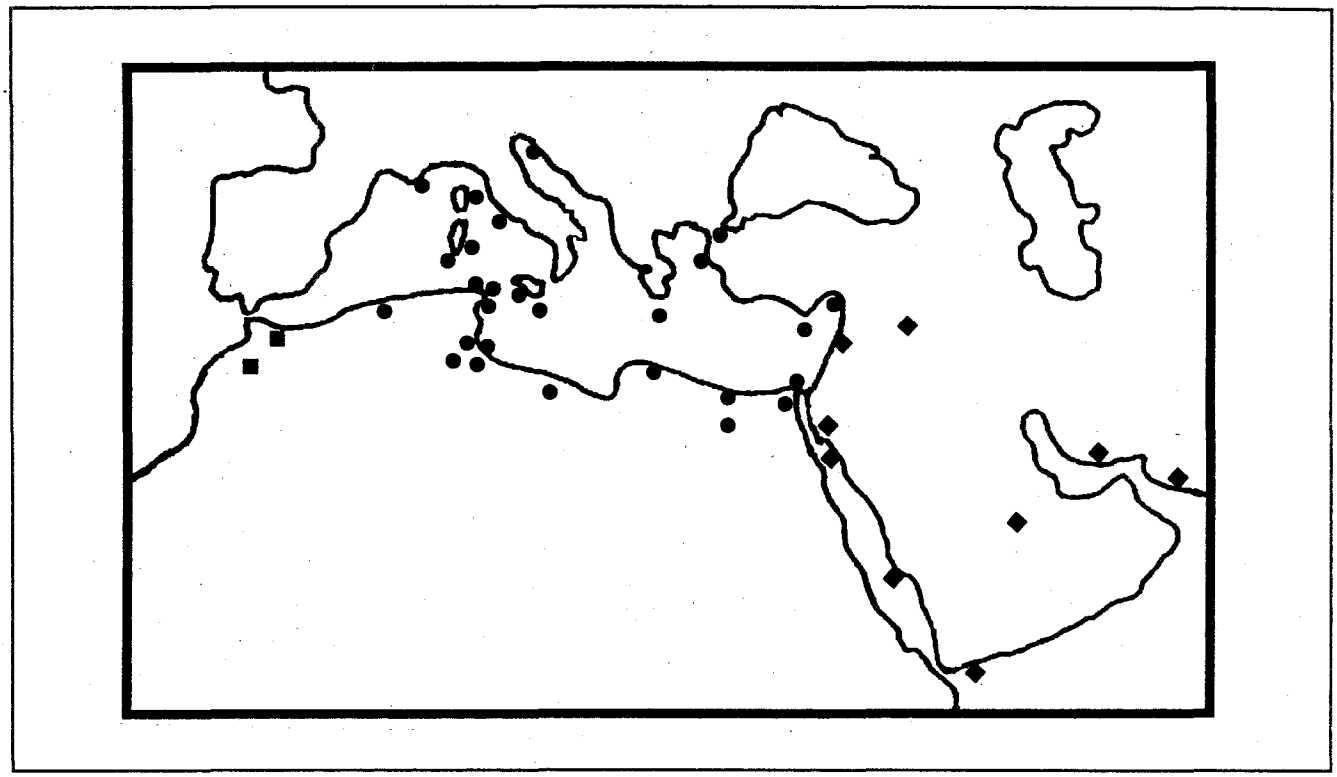

Fig. 1 *A. fasciatus* (●), *A. dispar* (◆) and *A. iberus* (■) distribution in the Mediterranean Area. (after Villwock, 1985)

season when the reservoir overflows into it. This may explain the intermittent occurrence of killifish in the Marsa canal over the years.

At Salina, the fish occurred in the narrow canals between the salterns, which are used to fill the saltpans with seawater for the production of sea-salt. At both Ghadira and Is-Simar, the fish occurred in the water pools within the bird sanctuaries in these two localities. Zammit & Van Es, 1980) Both Ghadira and Simar are reconstructed and engineered wetlands. It is known that the population of *Aphanius fasciatus* at Ghadira was introduced by the non-governmental organization that runs the sanctuary. Fish from two distinct natural populations, that at Salina and that which used to occur at Marsa, were introduced into Ghadira (A.E. Baldacchino, personal communication), which is unfortunate in view of the possible occurrence of different ecotypes. The same non-governmental organization in turn introduced fish from Ghadira to Simar. In addition to the population in the brackish water pool at Ghadira, a small population of killifish was found in a water reservoir (estimated volume *ca* $45m^3$) on farmland close to the Ghadira bird sanctuary, where they co-occurred with 'domestic' goldfish. The most likely provenance of this population is the Ghadira bird sanctuary.

Because of difficulty of access, population size could only be assessed visually for the populations in the reservoirs at Marsa and Ghadira and was estimated to be in the low hundreds in both cases. For the other localities an attempt was made to estimate the population by standardised collecting and the results are shown in Table 1. However, these results are at best only indicative as the success of collecting these fish depends greatly on the habitat. Thus, at Simar, the fish could easily hide amongst reeds, which impede sweeping with the net, so the population here is almost certainly underestimated. The individuals at both Ghadira and at Simar were generally small, (size range 2-3cm and 3-4cm respectively) relative to individuals from Salina (size range 5-7cm).

CONCLUSIONS

Of the seven localities where *Aphanius fasciatus* has been recorded, it is now only found in four, Salina, Simar and Ghadira, and the reservoir at Marsa; fish may also possibly occur in the inner reaches of Marsa Creek, although none were spotted here during the present survey. All four populations are large and thriving. The populations at Ghadira and Simar occur in artificially engineered pools and are derived from mixed parent populations, originating from Salina and Marsa. Therefore, the only truly natural populations of this species that still occur in the Maltese Islands appear to be those at Salina and Marsa. Although thriving, both these populations are rather vulnerable since they occur in extremely anthropised environments: the first in the canals supplying the salterns and the second in a reservoir used for the storage of irrigation water.

The life cycle of *Aphanius fasciatus* does not include dispersal phases and therefore gene flow between different populations is very limited; consequently, the species

presents a high degree of morphological and genetic differentiation among populations (Tigano & Ferrito, 1985; Parenti & Tigano, 1993; Tigano *et al.*, 1999; 2001; Maltagliati, 1998; 1999; Ferrito *et al.*, 2002). Given the high scientific interest of *Aphanius fasciatus* and its actual threatened status, urgent intervention is required for the conservation of this species in the Mediterranean, and in particular of the last remaining natural populations in the Maltese islands.

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JEWEL BEETLES (COLEOPTERA, BUPRESTIDAE) FROM THE MALTESE ISLANDS (CENTRAL MEDITERRANEAN)

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ABSTRACT

The jewel beetle fauna of the Maltese Islands is reviewed, based on literature records and where possible examination of earlier citations and of recently collected material. A total of seventeen species have been recorded of which seven species are new records for the Maltese Islands. These are *Acmaeoderella* (*Carininota*) *flavofasciata flavofasciata* (Piller & Mitterparcher, 1783), *Acmaeoderella* (*Euacmaeoderella*) *lanuginosa lanuginosa* (Gyllenhal, 1870), *Anthaxia* (*Anthaxia*) *thalassophila thalassophila* Abeille de Perrin, 1900, *Agrilus* (*Agrilus*) *derasofasciatus* Lacordaire, 1835, *Agrilus* (*Agrilus*) *roscidus* Kiesenwetter, 1857, *Aphanisticus pygmaeus* Lucas, 1849 and *Trachys corusca* (Ponza, 1805), two of which were previously based on misidentifications.

INTRODUCTION

The Buprestidae is a very large group of beetles comprising approximately 400 genera and over 15,000 described species. About 1,500 species are known from the Palaearctic Region and there are about 200 European species. Most species have a very characteristic form, being rigid and heavily sclerotized, often with a brilliant metallic colouration, hence their common name of jewel beetles or metallic wood-boring beetles.

Larvae of jewel beetles develop in living, dying or dead plants, under the bark or in the wood of trees and shrubs, in twigs or stems of herbaceous plants, in roots and basal parts of trunks of trees, shrubs or perennial herbs, or as leaf miners. Due to the dorso-ventrally flattened larvae, tunnels are always oval in cross section. Larvae usually pupate under the bark, less frequently in the sapwood of their host plants, leaf-miners pupate in a small pupal chambre in the leaf parenchyme. The food of adult buprestids is not usually related to the larval host plants. Many adults are flower visitors feeding on pollen, while other species feed on leaves, exceptionally on bark of young twigs. In spite of the large size of the family and their plant feeding habits, relatively few species are of economic importance. In general, buprestids tend to attack plants which are already damaged, injured, or physiologically stressed. In the Mediterranean and warm temperate zones of the Palaearctic, the larva of *Capnodis tenebrionis* (Linnaeus, 1761) can be a serious pest of stone fruit trees, where heavy infestations can kill the host plant. Some species, namely from the genus *Agrilus* Curtis, 1825, can serve as transmitors of tracheomycoses of oaks, elms and fruit trees.

Although, several attempts have been made in recent years to reassess the higher classification of buprestids, this is still in a state of flux. The number of subfamilies recognized vary from five to thirteen depending on the author, whereas Holyñski (1988; 1993) recognized only four main buprestid lineages.

HISTORICAL REVIEW

The first mention of buprestid beetles from the Maltese Islands was by Gulia, who in 1857 delivered a series of lectures on the insect fauna of the Maltese Islands. These lectures were published a year later (Gulia, 1858). Gulia (1858) recorded three species of buprestids, *Buprestis tenebricosa* Olivier, 1790, *B. discoidea* Fabricius, 1787 and *B. viridis* Linnaeus, 1758 of which only *Acmaeoderella discoidea* (Fabricius, 1787) forms part of the Maltese buprestid fauna. Due to the fact that most identifications cited by Gulia (1858) are now considered to be unreliable (e.g. Mifsud, 2000) the mentioned buprestid records will not be considered further. Besides, in this same work, Gulia mentioned three other buprestid species collected from the Maltese Islands. These buprestids were (fortunately) undetermined and the very brief descriptions furnished do not provide sufficient information to indicate which species Gulia was referring to. In 1907, Cameron & Caruana Gatto published an important work on the Coleoptera of the Maltese Islands, which is still the only faunistic work dealing with all beetle groups. In this work (Cameron & Caruana Gatto, 1907), only four species of buprestids were recorded. In 1916 Andres, published a list of Lepidoptera, Hemiptera and Coleoptera he had collected from these islands during the almost two year period he spent in Malta as a prisoner of war. In this work (Andres,

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1916), only one species of buprestid was included. Saliba (1963) published a list of insect pests of crop plants in the Maltese Islands in which he mentioned *Capnodis tenebrionis* (Linnaeus, 1761) as a very common pest on apricot and plum trees, and less common on almond, apple and pear trees. Levey (1985) revised the *Anthaxia umbellatarum* species group describing *Anthaxia scylla* Levey, 1985 from material collected in Italy and Malta. More recently, Cilia (1989), contributed an annotated list of endemic, rare, threatened and/or scientifically interesting beetles in the Red Data Book for the Maltese Islands. In this work, Cilia included information on six species of buprestid beetles, four of which were previously unrecorded. Curletti (1994), in his buprestid catalogue for Italy, included nine species from the Maltese Islands, four of which were new records.

MATERIAL AND METHODS

Material was examined or is cited from the following institutions and private collections:

BMNH The Natural History Museum, London, UK
CEM private collection - Ebejer, Malta
CMM private collection - Mifsud, Malta
CMDM private collection - Magro, Malta
NHMM Natural History Museum, Mdina, Malta
NMGW National Museums & Galleries of Wales, Cardiff, UK
NMPC National Museum, Prague, Czech Republic

The present work was undertaken to provide an overview of the buprestid fauna of the Maltese Islands. Where possible we have undertaken the examination of previously cited material. Additional collections were carried out throughout the Maltese Islands. The classification and species sequence follows the checklist of the Italian fauna (Gobbi & Platia, 1995). For each species earlier citations are provided, excluding those of Luigioni (1929) which were entirely based on the records of Cameron & Caruana Gatto (1907), a list of material examined, local and global distribution, host plants and additional notes where relevant.

CATALOGUE OF MALTESE BUPRESTIDAE

Acmaeoderella (*Acmaeoderella*) *discoidea* (Fabricius, 1787)
Acmaeoderella (*Carininota*) *flavofasciata flavofasciata* (Piller & Mitterparcher, 1783)
Acmaeoderella (*Euacmaeoderella*) *lanuginosa lanuginosa* (Gyllenhal, 1817)
Ptosima flavoguttata flavoguttata (Illiger, 1803)
Capnodis tenebrionis (Linnaeus, 1761)
Buprestis (*Buprestis*) *novemmaculata novemmaculata* Linnaeus, 1767
Melanophila cuspidata (Klug, 1829)
Anthaxia (*Haplanthaxia*) *aprutiana* Gerini, 1955
Anthaxia (*Haplanthaxia*) *millefolii polychloros* Abeille de Perrin, 1894
Anthaxia (*Anthaxia*) *lucens lucens* Küster, 1852
Anthaxia (*Anthaxia*) *manca* (Linnaeus, 1767)
Anthaxia* (*Anthaxia*) *thalassophila thalassophila Abeille de Perrin, 1900
Chrysobothris* (*Chrysobothris*) *solieri Gory & Laporte, 1839
Agrilus* (*Agrilus*) *derasofasciatus Lacordaire, 1835
Agrilus* (*Agrilus*) *roscidus Kiesenwetter, 1857
Aphanisticus pygmaeus Lucas, 1849
Trachys coruscus Ponza, 1805

ANNOTATED LIST OF SPECIES

***Acmaeoderella* (*Acmaeoderella*) *discoidea* (Fabricius, 1787)**
Acmaeodera discoidea (Fabricius, 1787); Cameron & Caruana Gatto, 1907: 397.
Acmaeoderella discoidea (Fabricius, 1787); Curletti, 1994: 33-34.

Material examined - Malta: no additional data, 11 exs., G. C. Champion, BM1927-408 (BMNH); Gharghur, 7. iv.1962, 1 ex., De Lucca (NHMM); Mosta, 4.iv.1965, 2 exs., K. M. Guichard, BM 1965-273 (BMNH); Wied Sewda, 26.iv.1975, 1 ex., leg. J. Cilia (CMM); Tal-Munxar (St. Thomas Bay), 9.iv.1989, 2 exs., leg. D. Mifsud (CMM); towards tal-Munxar (St. Thomas Bay), 28. iv.2002, 2 exs., on flowers of *Pallenis spinosa*, leg. D. Mifsud (CMM).

Notes - Besides the localities mentioned above, the species has also been recorded from 'Bahar' (possibly referring to Bahrija), Buskett, 'Copay' (?) and Wied il-Ghasel (Curletti, 1994).

Host plants - The species is known to develop in *Cardus* sp. and *Cirsium eriophorum*. Adults are commonly found on flowers.

Distribution - Syria, Libya, Egypt, Italy (including Sardinia and Sicily), Malta, France (only in Corsica), Spain, Portugal, Tunisia, Algeria and Morocco.

***Acmaeoderella* (*Carininota*) *flavofasciata flavofasciata* (Piller & Mitterparcher, 1783)**

Material examined - Malta: Floriana, 3.vii.1978, 1 ex., leg. J. Cilia (CMM).

Notes - New record for the Maltese Islands.

Host plants - The species develops in dead wood of *Castanea sativa*, *Fagus sylvatica*, *Juniperus communis*, *Prunus avium*, *Quercus ilex*, *Quercus pubescens*, *Quercus robur* and *Quercus suber*. Adults are usually found on flowers or on the mentioned host plants.

Distribution - South Russia, Ukraine, Armenia, Azerbaijan, Georgia, Moldova, Czech Republic, Slovakia, Bulgaria, Romania, Slovenia, Bosnia, Croatia, Turkey, Hungary, Austria, Yugoslavia, Greece, Germany, Spain, Switzerland, France (including Corsica), Italy (including Sardinia and Sicily) and Malta.

***Acmaeoderella (Euacmaeoderella) lanuginosa lanuginosa* (Gyllenhal, 1817)**

Material examined - Malta: Ghar Lapsi, 20.vi.1993, 1 ex., on flowers of *Cynara* sp., leg. D. Mifsud (CMM).

Notes - New record for the Maltese Islands. The subspecies *reducta* Schaefer occurs only in Corsica and Sardinia.

Host plants - The species is known to develop in *Cynara* sp., *Euphorbia beaumeriana*, *Ferula communis*, *Thapsia garganica* and *Thapsia villosa*. Adults are commonly found on flowers.

Distribution - Israel, Syria, Greece, Italy (including Sicily), Malta, Spain, Tunisia, Algeria and Morocco.

***Ptosima flavoguttata flavoguttata* (Illiger, 1803)**
Ptosima undecimmaculata (Herbst, 1784); Cilia, 1989: 116.

Material examined - Malta: Bingemma, ix.1981, 1 ex., leg. J. Cilia (CMM).

Notes - The correct identity Cilia's record (Cilia, 1989), is here confirmed.

Host plants - The species is known to develop in trunks and thick branches of *Ceratonia siliqua*, *Crataegus oxyacantha*, *Malus domesticus*, *Prunus armeniaca*, *Prunus avium*, *Prunus domestica*, *Prunus dulcis*, *Prunus mahaleb*, *Prunus persica*, *Prunus spinosa*, *Prunus vulgaris* and *Pyrus communis*.

Distribution - Southern Russia, Iran, Syria, Turkey, Greece, Albania, Romania, Moldova, Bulgaria, Yugoslavia, Bosnia, Croatia, Slovenia, Czech Republic, Slovakia, Hungary, Germany, Switzerland, Italy (including Sardinia and Sicily), Malta, France (including Corsica), Spain, Portugal, Egypt, Algeria and Morocco.

***Capnodis tenebrionis* (Linnaeus, 1761)**
Capnodis tenebrionis (Linnaeus, 1761); Cameron & Caruana Gatto, 1907: 397; Saliba, 1963: 12; Cilia, 1989: 116; Curletti, 1994: 55-56.

Material examined - Malta: Zejtun, 1.x.1990, 1 ex., leg. D. Mifsud (CMM); Rabat, 9.iv.1995, 2 exs., on stone-fruit trees, leg. D. Mifsud (CMM); Dingli, 5.i.1998, 1 ex., leg. D. Mifsud (CMM); Rabat, 23.x.2001, 1 ex., leg. P. M. Sammut (NHMM); St. Julians, 22.vii.1990, 1 ex., leg. A. Micallef (CMM); Ghajn Rihana, 26.ix.2002, 1 ex., leg. D. Mifsud **(CMM).**

Notes - Cameron & Caruana Gatto (1907) state that this species is rare in the Maltese Islands giving only Girgenti as locality where found. Saliba (1963) indicates that the species is a very common pest on apricot and plum trees and less common on almond, apple and pear trees. In the Red Data Book for the Maltese Islands, Cilia (1989) assigned the status of this species as locally vulnerable, stating "*Sometimes found on fruit trees but never common; persecuted because mistakenly considered a pest*". Curletti (1994) recorded the species from Buskett. At present, the status of this species locally can be better defined as an infrequent pest of stone-fruit trees.

Host plants - The species is known to develop in roots and the basal parts of trunks of *Cotoneaster ramiflora*, *Cotoneaster* sp., *Crataegus monogyna*, *Crataegus oxyacantha*, *Cydonia oblonga*, *Malus domestica*, *Mespilus germanica*, *Prunus armeniaca*, *Prunus avium*, *Prunus cerasus*, *Prunus dulcis*, *Prunus domestica*, *Prunus mahaleb*, *Prunus mariana*, *Prunus padus*, *Prunus persica*, *Prunus spinosa* and *Pyrus communis*. Adults are commonly found on the mentioned host plants.

Distribution - Russia, Armenia, Azerbaijan, Georgia, Turkmenistan, Iran, Iraq, Israel, Lebanon, Jordania, Syria, Turkey, Cyprus, Greece, Albania, Yugoslavia, Croatia, Bosnia, Slovenia, Moldova, Bulgaria, Romania, Hungary, Czech Republic, Slovakia, Ukraine, Austria, Switzerland, Italy (including Sardinia and Sicily), Malta, France (including Corsica), Spain, Portugal, Morocco, Algeria and Tunisia.

***Buprestis (Buprestis) novemmaculata novemmaculata* Linnaeus, 1767**
Buprestis novemmaculata Linnaeus, 1767; Curletti, 1994: 79-80.

Material examined - None.

Notes - This species was recorded by Curletti (1994) from Malta (Buskett).

Host plants - The species is known to develop in wood of dead or dying trunks of the following trees: *Larix decidua*, *Picea abies*, *Pinus halepensis*, *Pinus laricio*, *Pinus leucodermis*, *Pinus nigra*, *Pinus pinaster*, *Pinus pinea*, *Pinus salzmanni* and *Pinus sylvestris*. Adults are found on sawed wood of pine and on logs. Development lasts for at least two years.

Distribution - Russia (including Siberia), Sweden, Finland, Denmark, Poland, Germany, Czech Republic, Slovakia, Ukraine, Byalarus, Hungary, Romania, Moldova, Bulgaria, Yugoslavia, Bosnia, Croatia, Slovenia, Turkey, Greece, Albania, Austria, Switzerland, France (including Corsica), Italy (including Sardinia and Sicily), Malta, Spain, Portugal and Algeria. The species was also introduced to South America (Chile).

***Melanophila cuspidata* (Klug, 1829)**
Melanophila aequatus Marshal [*sic*]; Andres, 1916: 58.

Material examined - Malta: Girgenti, 25.vii.1997, 1 ex., on branches of *Ulmus* sp., leg. D. Mifsud (CMM).

Notes - This species was recorded for the first time from the Maltese Islands by Andres (1916), whose record was based on a single specimen collected during the month of October from the Verdala barracks (Cospicua) which at that time served as prisons.

Host plants - This species is known to develop in fire-damaged branches and stems of *Cupressus sempervirens*, *Ficus carica*, *Juniperus macrocarpa*, *Juniperus oxycedrus*, *Juniperus phoenicea*, *Phyllirea angustifolia*, *Pinus halepensis*, *Pinus pinea*, *Pistacia lentiscus*, *Quercus ilex*, *Quercus pubescens*, *Quercus suber*, *Salix alba*, *Spartium junceum* and *Ulmus minor*. Adults are usually found on the mentioned host plants.

Distribution - Southern Russia, Iran, Syria, Turkey, Greece, Albania, Yugoslavia, Croatia, Italy (including Sardinia and Sicily), Malta, France (including Corsica), Spain, Egypt, Sudan, Algeria and Morocco.

***Anthaxia (Haplanthaxia) aprutiana* Gerini, 1955** (Fig. 1)
Anthaxia umbellatarum (Fabricius, 1787); Cameron & Caruana Gatto, 1907: 397; Curletti, 1994: 108-110.
Anthaxia scylla Levey, 1985; Levey, 1985: 301-302.
Anthaxia nitidula (Linnaeus, 1758); Cilia, 1989: 117.
Anthaxia aprutiana Gerini, 1955; Curletti, 1994: 110-111.

Material examined - Malta: Ghajn Rihana, 20.viii.1989, 1 ex., leg. D. Mifsud (CMM); Mtahleb, 1.viii.1996, 1 ex., leg. D. Mifsud (CMM); Wied id-Dis, 27.vi.1997, 2 exs., leg. D. Mifsud (CMM, NMPC); Wied Qannotta, 19. vii.1992, 1 ex., leg. D. Mifsud (CMM, NMPC); Wied Qannotta, 13.vii.1992, 1 ex., leg. L. F. Cassar (CMM); Buskett, 5.vi.1976, 1 ex., leg. J. Cilia (CMM); Wied Faham, 14.v.1979, 1 ex., on *Crataegus* sp., leg. J. Cilia (CMM).
Gozo: Ghasri, 25.vi.1995, 1 ex., leg. C. Farrugia (CMM); Victoria, 13.vii.1995, 1 ex., leg. C. Farrugia (NMGW).

Notes - This species was originally recorded as *A. umbellatarum* by Cameron & Caruana Gatto (1907). Through examination of this and additional material, Levey (1985), in his revision of the *A. umbellatarum* species group described this taxon as *Anthaxia scylla*. Levey (1985), perhaps overlooked the description *of A. aprutiana* provided by Gerini (1955). Cilia (1989) recorded *A. nitidula*, but examination of this material concluded that this has to refer to *A. aprutiana*. Curletti (1994) mentioned *A. umbellatarum* from Malta, but this citation is based on the original records of Cameron & Caruana Gatto (1907). Thus, even though, the possible presence of *A. umbellatarum* in the Maltese Islands is not excluded, the material so far collected is all attributed to *A. aprutiana*. Besides the localities listed above, the species has been also recorded from the following localities in Malta: Birzebbugia, Chadwick Lakes, Wied il-Ghasel and Wied Qirda (Levey, 1985; Curletti, 1994).

Host plants - The species is known to develop in branches of *Castanea sativa* (Curletti, 1994) and probably also in

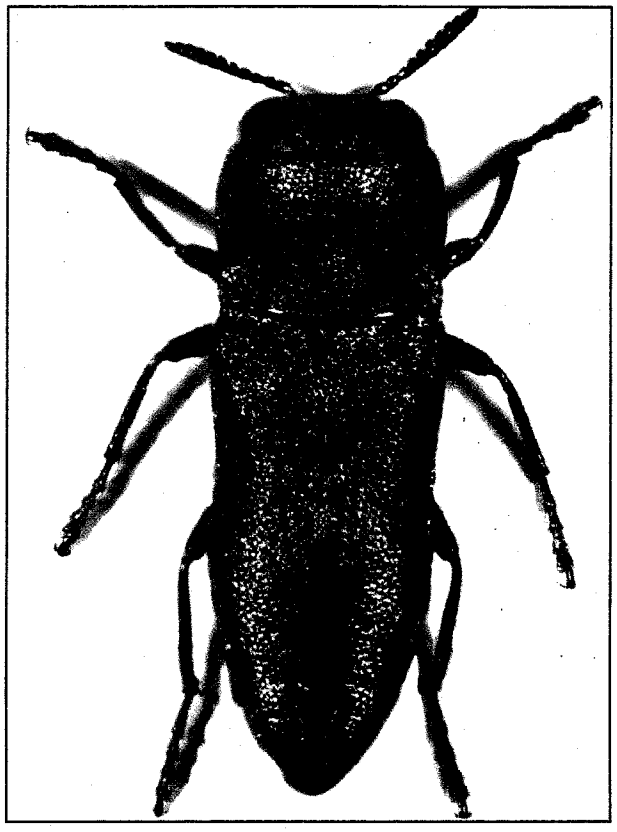

Fig. 1 *Anthaxia (Haplanthaxia) aprutiana* Gerini, 1955 (x 20)

Pistacia spp. Adults are found on flowers. *Castanea sativa* is lacking from the Maltese flora, and all attempts to grow this tree locally have invariably failed (Borg, 1922).

Distribution - So far, *A. aprutiana* is known to occur in Italy (Friuli-Venezia Giulia, Abruzzo, Molise, Basilicata and Sicily) and the Maltese Islands (Curletti, 1994).

***Anthaxia (Haplanthaxia) millefolii polychloros* Abeille de Perrin, 1894**
Anthaxia millefolii ssp. *polychloros* Abeille de Perrin, 1894; Curletti, 1994: 112-114.

Material examined - Malta: Fiddien, 27.vi.1989, 4 exs., leg. D. Mifsud (CMM).

Notes - This species was recorded from the Maltese Islands by Curletti (1994) from the following localities in Malta: Buskett, Chadwick Lakes and Wied Incita.

Host plants - The larva is known to develop in several unrelated host plants including *Acer obtusatum*, *Castanea sativa*, *Ceratonia siliqua*, *Nerium oleander*, *Pistacia lentiscus*, *Prunus avium*, *Prunus domestica*, *Prunus dulcis*, *Pyrus amygdaliformis*, *Quercus cerris*, *Quercus coccifera*, *Quercus ilex*, *Quercus pubescens*, *Quercus robur* and *Sorbus* sp. (Curletti, 1994). *A. millefolii* is probably the most polyphagous species within the genus *Anthaxia* Eschscholtz, 1829. Adults are commonly found on flowers.

Distribution - Germany, Switzerland, Italy (including

Sardinia and Sicily), Malta, France (including Corsica), Spain, Portugal, Morocco, Algeria and Tunisia.

***Anthaxia (Anthaxia) lucens lucens* Küster, 1852**
Anthaxia candens ssp. *lucens* Küster, 1852; Curletti, 1994: 93-94.

Material examined - Malta: Mosta, 4.iv.1965, 2 exs., K. M. Guichard, BM 1965-273 (BMNH); Wied il-Ghasel, 13. iv.1994, 1 ex., leg. M. J. Ebejer (CEM); Qrendi, Maqluba, 9.v.2002, 1 ex., leg. D. Magro (CMDM); 11.v.2000, 1 ex., leg. A. Seguna (CMM).

Notes - This species was recorded from the Maltese Islands by Curletti (1994) from the following localities on Malta: Hamrun and Wied il-Ghasel.

Host plants - This species is known to develop in branches of *Prunus dulcis* (Gobbi, 1986); other species of *Prunus*, *Cerasus* and *Amygdalus* are also used as host plants of this species. Adults are found on flowers.

Distribution - Turkey, Crete, Greece, Yugoslavia, Albania, Italy (including Sicily) and Malta.

***Anthaxia (Anthaxia) manca* (Linnaeus, 1767)**
Anthaxia manca Linnaeus, 1767; Cilia, 1989: 116.

Material examined - Malta: Buskett, 12.iii.1977, 2 exs., on *Rhamnus* sp., leg. J. Cilia (CMM).

Notes - The species was recorded from Malta by Cilia (1989) on the basis of the above mentioned material.

Host plants - The species is known to develop in branches of *Ulmus minor*, *Ulmus laevis*, *Ulmus carpinifollia.*, *Castanea sativa*, *Populus tremula*, *Prunus mahaleb*, *Rhamnus alaternus*, *Robinia pseudoacacia* and *Tilia cordata* (Curletti, 1994) with a preference to *Ulmus* spp. Adults are usually seen on leaves of the host plants, quite exceptionally also on flowers (e.g. of *Crataegus*). The development lasts from two to three years.

Distribution - Iran, Turkey, Southern Russia, Turcmenia, Armenia, Georgia, Tadjikistan, Ucraine, Moldova, Poland, Germany, Czech Republic, Slovakia, Romania, Bulgaria, Yugoslavia, Greece, Bosnia, Croatia, Slovenia, Albania, Austria, Italy (including Sardinia and Sicily), Malta, France (including Corsica), Spain, Portugal, Morocco and Algeria.

Table 1 Chorotype ranges of the species following Vigna Tagliani *et al.*, 1992.

Species list	Chorotype range
Acmaeoderella (*Acmaeoderella*) *discoidea* (Fabricius, 1787)	TEM
Acmaeoderella (*Carininota*) *flavofasciata flavofasiata* (Piller & Mitterparcher, 1783)	CAE
Acmaeoderella (*Euacmaeoderella*) *lanuginosa lanuginosa* (Gyllenhal, 1817)	WME
Ptosima flavoguttata flavoguttata (Illiger, 1803)	CEM
Capnodis tenebrionis (Linnaeus, 1788)	CEM
Buprestis (*Buprestis*) *novemmaculata novemmaculata* Linnaeus, 1767	PAL
Melanophila cuspidata (Klug, 1829)	TEM
Anthaxia (*Haplanthaxia*) *millefolii polychloros* Abeille de Perrin, 1894	Sub-Endemic
Anthaxia (*Haplanthaxia*) *millefolii polychloros* Abeille de Perrin, 1894	WME
Anthaxia (*Anthaxia*) *lucens lucens* Küster, 1852	TUE
Anthaxia (*Anthaxia*) *manca* (Linnaeus, 1767)	CEM
Anthaxia (*Anthaxia*) *thalassophila thalassophila* Abeille de Perrin, 1900	TUE
Chrysobothris (*Chrysobothris*) *solieri* Gory & Laporte, 1839	CEM
Agrilus (*Agrilus*) *derasofasciatus* Lacordaire, 1835	MED*
Agrilus (*Agrilus*) *roscidus* Kiesenwetter, 1857	CEM
Aphanisticus pygmaeus Lucas, 1846	CAM
Trachys corusca (Ponza, 1805)	WPA

Abbreviations: CAE: Central Asiatic-European; CAM: Central Asiatic Mediterranean; CEM: Central Asiatic-European-Mediterranean; MED: Mediterranean; MED*: originally Mediterranean but now widespread in Palaearctic and introduced in USA; PAL: Palaearctic; TEM: Turranic-European-Mediterranean; TUE: Turranic-European; WME: W-Mediterranean; WPA: W-Palaearctic.

***Anthaxia (Anthaxia) thalassophila thalassophila* Abeille de Perrin, 1900**
Anthaxia scutellaris Genè, 1839; Cilia, 1989: 116.

Material examined - Malta: Il-Ballut (limits of Wardija), 20.iv.1980, 1 ex., leg. J. Cilia (CMM); Buskett, 14.v.1985, 1 ex., leg. J. Cilia (CMM).

Notes - New record for the Maltese Islands. The record of *A. scutellaris* by Cilia (1989) should refer to this species.

Host plants - The species is know to develop in dying branches of *Castanea sativa*, *Fraxinus excelsior*, *Fraxinus ornus*, *Pistacia lentiscus*, *Pistacia terebinthus* and *Quercus pubescens* (Contarini, 1983). Adults are usually found on these host plants and on flowers.

Distribution - Albania, Croatia, Yugoslavia, France (including Corsica), Italy (including Sardinia and Sicily) and Malta.

***Chrysobothris (Chrysobothris) solieri* Gory & Laporte, 1839**
Chrysobothris solieri Gory & Laporte, 1839; Curletti, 1994: 131-132.

Material examined - None.

Notes - This species was recorded by Curletti (1994) from Malta (Buskett).

Host plants - This species is known to develop in *Pinus halepensis*, *Pinus laricio*, *Pinus nigra*, *Pinus pinaster*, *Pinus pinea*, *Pinus salzmanni* and *Pinus sylvestris*.

Distribution - Albania, Bosnia, Croatia, Slovenia, Yugoslavia, Romania, Bulgaria, Turkey, Greece, Austria, Switzerland, France (including Corsica), Italy (including Sardinia and Sicily), Malta, Spain, Portugal, Tunisia and Algeria.

***Agrilus (Agrilus) derasofasciatus* Lacordaire, 1835**
Agrilus obscuricollis Kiesenwetter, 1857; Cameron & Caruana Gatto, 1907: 397; Curletti, 1994: 154.

Material examined - Malta: (no other data), 3 exs., Dr. Cameron; 'Boschetto', v.1903, 3 exs., Dr. Cameron; Dingli, 13.vi.1994, 1 ex., leg. D. Mifsud (CMM).

otes - New record for the Maltese Islands. The record of *Agrilus obscuricollis* by Cameron & Caruana Gatto (1907) should refer to this species. Curletti's record of *A. obscuricollis* (1994) was based on that of Cameron & Caruana Gatto (1907).

Host plants - This species is known to develop in branches of *Vitis sylvestris* and *Vitis vinifera*.

Distribution - Southern Russia, Armenia, Azerbaijan, Georgia, Turkey, Ukraine, Moldova, Poland, Germany, Czech Republic, Slovakia, Hungary, Romania, Bulgaria, Bosnia, Croatia, Slovenia, Yugoslavia, Albania, Greece, Austria, Switzerland, Italy (including Sardinia and Sicily), Malta, France (including Corsica), Spain, Egypt, Tunisia, Algeria and Morocco. The species is nowadays widespread in Europe and was also introduced in USA, following vine cultivation.

***Agrilus (Agrilus) roscidus* Kiesenwetter, 1857**

Material examined - Malta: Dingli, 13.vi.1994, 7 exs., leg. D. Mifsud (BMNH, CMM); Mtahleb, 3.vii.1994, 2 exs., leg. D. Mifsud (CMM); Kalkara, 8.vii.1993, 1 ex., leg. D. Mifsud (CMM); Birzebbuga, 15.vi.1995, 2 exs., leg. D. Mifsud (CMM). Gozo: Ghasri, 16.v.1996, 1 ex., leg. D. Mifsud (CMM); Wied Lunzjata, 20.vii.1996, 1 ex., leg. C. Farrugia (CMM); Victoria, 20.vi.1995, 1 ex., leg. C. Farrugia (CMM).

Notes - New record for the Maltese Islands.

Host plants - An extremely polyphagous species developing in branches of *Ceratonia siliqua*, *Crataegus oxyacantha*, *Cydonia oblonga*, *Crataegus* spp., *Euonymus europaeus*, *Malus domestica*, *Mespilus germanica*, *Prunus armeniaca*, *Prunus avium*, *Prunus domestica*, *Prunus dulcis*, *Prunus mahaleb*, *Prunus persica*, *Prunus vulgaris*, *Populus* spp., *Pyrus amygdaliformis*, *Pyrus communis*, *Salix* spp., *Sorbus aria* and *Ulmus* spp. Adults are usually found on these host plants.

Distribution - Southern Russia, Moldova, Ukraine, Israel, Lebanon, Cyprus, Syria, Turkey, Germany, Czech Republic, Slovakia, Hungary, Romania, Bulgaria, Bosnia, Croatia, Slovenia, Yugoslavia, Greece, Austria, Switzerland, Italy (including Sardinia and Sicily), Malta, France (including Corsica), Spain, Portugal, Egypt, Algeria and Morocco.

***Aphanisticus pygmaeus* Lucas, 1849**

Material examined - Malta: Ghajn Rihana, 28.vii.1999, 1 ex., leg. C. Farrugia (CMM).

Notes - New record for the Maltese Islands.

Host plants - Unknown.

Distribution - Southern Russia, Azerbaijan, Afghanistan, Israel, Kazakhstan, Tadjikistan, Turcmenistan, Uzbekistan, Mongolia, Turkey, Bulgaria, Moldova, Croatia, Yugoslavia, Greece, Italy (including Sardinia and Sicily), Malta, France (including Corsica), Spain, Algeria, Egypt, Tunisia and Morocco.

***Trachys corusca* Ponza, 1805**

Material examined - Malta: Marsa, Ghammieri, 8.v.1996, 1 ex., leg. D. Mifsud (CMM); Wied il-Ghasel, 14.iv.1999, 1 ex., leg. C. Farrugia (CMM); Qrendi, Maqluba, 25.vii.2002, 1 ex., leg. D. Magro (CMDM).

Notes - New record for the Maltese Islands.

Host plants - The species is known to develop in leaves of *Althea officinalis*, *Althea rosea*, *Hibiscus roseus*, *Lavatera olbia*, *Malva alcea*, *Malva narbonensis*, *Malva officinalis*, *Malva rotundifolia* and *Malva sylvestris*. Adults are usually found on the mentioned host plants.

Distribution - Albania, Algeria, Austria, Bosnia, Bulgaria, Croatia, Czech Republic, Finland, France, Germany, Greece, Hungary, Italy, Malta, Libya, Morocco, the Netherlands, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tunisia, Turkey, Ukraine, Yugoslavia.

CONCLUSIONS

In general, buprestid beetles are rather infrequent in the Maltese Islands. This may be due to several reasons, among which the scarcity of trees and habitat destruction are worth mentioning. Thus, though species which develop on shrubs and leaf miners may eventually prove to be more common and widespread in the Maltese Islands, species which are directly associated with trees are rare. In fact, records in this latter category are often based on single captures.

Table 1 shows the chorotype ranges of each species following Vigna Tagliani *et al.*, 1992. Such chorotypes give an indication of the distributional range of a particular species, however, this is a dynamic process and such ranges may change accordingly to future studies.

As indicated in Table 1, most species have wide geographical ranges. The most interesting species from a biogeographical point of view are *Anthaxia lucens lucens* and *Anthaxia thalassophila thalassophila* both of which represent eastern elements and *Anthaxia aprutiana* which is so far known only from Southern Italy and the Maltese Islands.

The buprestid fauna of the Maltese Islands, with 17 species recorded, is much more diverse than that of the other islands in the Sicilian channel (Lampedusa and Pelagic islands) with a total of 9 recorded species. From the Pelagic islands only 4 buprestid species are recorded, whereas 6 species are recorded from Pantelleria (Sparacio & Ratti, 1995). It is worth mentioning however, that only 3 species of buprestids are common to Pantelleria and the Maltese Islands, whereas no species are common to the Pelagic and the Maltese Islands. Also, there is a lack of North African affinities in the buprestid fauna of the Maltese Islands in comparison with the other islands, as indicated by the presence of *Julodis onopordi lampedusanus* Tassi, 1966 in Lampedusa and *Acmaeodera bipunctata romanoi* Sparacio, 1992 in Pantelleria (Sparacio & Ratti, 1995).

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AN APPRAISAL OF SCIENTIFIC NAMES USED IN THE 1915 LIST OF LICHENS OF THE MALTESE ISLANDS BY STEFANO SOMMIER AND ALFREDO CARUANA GATTO

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ABSTRACT

In 1915 Stefano Sommier and Alfredo Caruano Gatto published a list of lichens from the Maltese islands. Since then no other lists of local lichens have been published. This work reviews the lichen names appearing in the original checklist and, where relevant, alternative names are suggested based on contemporary usage.

INTRODUCTION

The lichen checklist published by Sommier and Caruana in the second volume of *Flora Melitensis Nova* (Sommier & Caruana Gatto, 1915) consists of 183 taxa with very brief notes indicating provenance. The lichens had been identified by Antonio Jatta. It remains the only publication which gives an idea of the lichen biodiversity that existed in our islands around a century ago. Since that date lichen taxonomical nomenclature has undergone great changes. Some generic names are not in use any more e.g. *Collemodium*. Several new genera have been proposed e. g. *Clauzadea* and several old generic names resurrected e.g *Pyrenocollema*. Within a few years the nomenclature of several taxa is likely to change again (Nimis, 1993).

The best way to know which lichens were growing on our islands in 1915 is to examine the entire collection of local lichens at the University Herbarium, at Argotti Gardens, Floriana and to identify them using contemporary methods of identification and taxonomical nomenclature. Such a highly desirable exercise should be attempted in the future. However, finally, one would still want to compare such a list with the original one by Sommier and Gatto (Sommier & Gatto, 1915). Unless the latter checklist has not been converted into a format in which old taxa, where relevant, are replaced by synonyms, comparison is not possible.

In this work I have made an attempt to review the lichen names listed and to replace them, when appropriate, with those which are currently considered valid. Less used synonyms have been excluded. For obvious reasons the updated version does not correct any misidentifications.

Unless otherwise stated most of the new lichen names have been sourced from the text, *Lichens of Italy* (Nimis, 1993). P.L.Nimis is a member of the OPTIMA Commission for Lichens which is trying to compile an inventory of lichen biodiversity of the Mediterrean (Nimis, 1996). Hence having our only old checklist converted to a form which is compatible with other Mediterranean checklists could be an initial small contribution to this project.

PROPERTIES OF MODIFIED CHECKLIST

For convenience, in the left hand column, the names of all 183 taxa which are listed in the old checklist are reproduced as they appeared originally. Provenance has been left out. The scientific name of the lichen as used today is given in the column on the right.

In some cases the name remains identical with maybe a change in authors only e.g. N°. 162: *Verrucaria tabacina* Mass. In other cases, the lichen has a change in genus while still retaining its specific name e.g. N°. 83: *Biatorina sylvestris* Arnd. Some of the lichens have had a change in their specific name still retaining their original generic name e.g. N°. 41: *Caloplaca murorum* (Hffm.) Th. A complete change in scientific name has occurred in a few other cases e.g. N°. 4: *Psorotichia riparia* Arnd. The sources used to trace lichen synonyms have been given only whenever this was not *Lichens of Italy* (Nimis, 1993)

The abbreviation "nrf" appears next to those lichen names for which no reference could be found. This was especially, but not always, the case for many of the varieties listed. Short explanatory notes have been added to some of the entries. A question mark after the suggested binomial suggests a certain amount of uncertainty. This is often explained in the accompanying note.

In some of the entries (e.g. N$^{os.}$ 12, 19, 20, 48) a second binomial is included. Here some extent of disagreement between the two main reference texts used (Nimis, 1993; Clauzade & Roux, 1985) might have been encountered. This prompted me to include both synonyms.

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1. -- Placynthium corallinoides (Hoffm.) Krb	= *Placynthium nigrum* (Hudson) Gray
2. -- Placynthium caesium (Duf.) Mass.	= *Psorotrichia schaereri* (Mass.) Arn.
3. -- Psorotichia murorum Mass.	= *Psorotichia murorum* Mass. = *Collemopsis murorum* (Massal.) Stiz (Clauz. & Roux, 1985)
4. -- Psorotichia riparia Arnd	= *Porocyphus rehmicus* (Flotow) Zahlbr.
5. -- Enchylium Rubbianum Mass	= *Forssellia affinis* (Massal.) Zahlbr (Cl. & Roux, 1985)
6. -- Collema pulposum Ach var. granulosum (Ach.) Krb. var. compactum Ach.	= *Collema tenax*) (Sw.) Ach nrf nrf
7. -- Collema cheileum (Ach.) Nyl.	= *Collema crispum* (Ach) Ach (Coppins, 2002) (note 1)
8. -- Collema limosum (Ach.) Nyl	= *Collema limosum* (Ach.) Ach.
9. -- Collema tenax (Sw.) Ach	= *Collema tenax* (Sw.) Ach.
10. -- Collema palmatum (non DC) Schaer.	= *Collema tenax* (Sw) Ach.
11. -- Collema Meliteum Jatta var. conglomeratum Jatta (endemic)	= *Collema tenax* (Sw.) Ach. = *C. tenax* (Sw.) Ach.
12.-- Collema granosum Wlf.	= *Collema auriforme* (With.) Coppins & Laundon = *C. auriculatum* Hoffm. (Clauz. & Roux, 1985)
13. -- Synechoblastus flaccidus Krb var. hydrelus (Fw.) Krb.	= *Collema subflaccidum* Degel. nrf
14. -- Collemodium subplicatile Nyl	= *Leptogium plicatile* (Ach.) Leight.? (note 2)
15. -- Collemodium turgidum (Schaer.) Nyl.	nrf (note 3)
16 -- Leptogium lacerum (Ach.) Nyl.	= *Leptogium lichenoides* (L.) Zahlbr.
17. -- Leptogium Schraderi Nyl.	= *Leptogium schraderi* Nyl.
18. -- Leptogium tenuissimum (Dcks.) Krb.	= *Leptogium tenuissimum* (Dcks.) Krb.
19. -- Leptogium subtile (Sm.) Nyl.	= *Leptogium subtile* (Schrad.) Torss = *L. tenuissimum* (Dcks.) Krb. (Cl. & Roux,1985)
20. -- Ramalina Duriaei (De Not.) Bagl.	= *Ramalina lacera* (With) Laundo = *R. duriaei* (De Not.) Bagl. (Cl. & Roux, 1985)
21. -- Xanthoria parietina (L.) Th. var. aureola (Ach.) Fr var. livida De Not. var. subgranulosa Nyl. var. ectanea Ach.	= *Xanthoria parietina* (L.) Th. Fr = *X. calcicola* Oxner (Coppins, 2002) = *X. parietina* ssp *calcicola* (Cl. & Roux, 1985) (note 4) nrf nrf = *X. ectaneoides* (Nyl.) Zahlbr.
22. -- Physcia tenella (Sc.) Nyl..	= *Physcia tenella* (Sc.) DC (note 5)
23. -- Physcia obscura Fr. var. virella (Ach.) Th.	= *Phaeophyscia ciliata* (Hoffm.) Mob. (note 5) = *P. orbicularis* (Neck.) Mob. (note 6)
24. -- Lecanora crassa (Hds.) Ach var. caespitosa (Vill.) Schaer.	= *Squamarina periculosa* (Schaer.) Poelt (note 7) nrf
25. -- Lecanora gypsacea (Sm.) Ach (endemic)	nrf
26. -- Lecanora lentigera (Web.) Ach.	= *Squamarina lentigera* (Web) Poelt (Coppins, 2002)
27. -- Lecanora sublentigera Jatta	= *Squamarina concrescens* (Müll. Arg) Poelt (note 8)
28. -- Lecanora saxicola (Poll.)	= *Lecanora muralis* (Schreber) Rabenh.

29. -- Lecanora fulgens (Sm.) Ach	= nrf
30. -- Lecanora pruinifera Nyl.	= *Lecanora pruinosa* Chaub.
31. -- Lecanora circinata (Pers.) Ach.	= *Aspicilia radiosa* (Nyl.) Poelt & Leuckert
32. -- Lecanora galactina Ach. var. muralis Mass	= *Lecanora albescens* (Hoffm.) Branth & Rostr. = *L. albescens* (Hoffm.) Branth & Rostr.
33. -- Lecanora subfusca Ach. var. allophana Ach. var. chlarona Ach var. argentata Ach. forma glabrata Schaer forma boeomycioides Mass.	= *Lecanora glabrata* (Ach) Malme? (note 9) = *L. pulicaris* (Pers.) Ach ? (Coppins, 2002) (note 9) nrf (note 9) nrf (note 9)
34. -- Lecanora Hageni Ach. Var. coerulescens (Schaer) Jatta	= *Lecanora hagenii* (Ach.) Ach = *L. hagenii* (Ach.) Ach
35. -- Lecanora sulphurea (Hffm.) Ach.	= *Lecanora sulphurea* (Hffm.) Ach.
36. -- Lecanora calcarea (L) Snarf Aspicilia calcarea var. concreta Schaer. cum forma farinosa (Flk) Schaer var. contorta (Flk) Jatta forma cinereovirens Mass var. viridescens (Mass.) Krb	= *Aspicilia calcarea* v. *reagens* nrf = *Aspicilia contorta* (Hffm.) Kempelh. s.lat = *A. contorta* (Hffm.) Kempelh. s.lat
37. -- Lecanora lithofraga (Mass.) Jatta	nrf
38. -- Lecanora hiascens (Mass.) Jatta	nrf
39. -- Acaraspora glaucocarpa (Wahl.) Krb.	= *Acaraspora glaucocarpa* (Ach.) Krb
40. -- Caloplaca aurea (Schael.) Jatta	= *Fulgensia sp* ? (note 10)
41. -- Caloplaca murorum (Hffm.) Th	= *Caloplaca saxicola* (Hoffm.) Nordin
42. -- Caloplaca pusilla Mass. var. umbratica Jatta	= *Caloplaca saxicola* (Hoffm.) Nordin
43. -- Caloplaca callopisma (Ach.) Th var. centroleuca Mass	= *Caloplaca aurantia* (Pers.) Steiner nrf
44. -- Caloplaca luteo-alba (Turn). Th	= *Caloplaca luteo-alba* (Turn). Th. (note 11)
45. -- Caloplaca ochracea (Schaer) Mass.	= *Caloplaca ochracea* (Schaer) Flagey
46. --Caloplaca erythrocarpa (Pers.) Th	= *Caloplaca erythrocarpa* (Pers.) Zw
47. -- Caloplaca Melitensis Jatta (endemic)	= *Caloplaca melitensis*. Jatta?
48. -- Caloplaca aurantiaca (Lgthf.) Th var. Velana Mass var. diffracta Mass var. leucotis Mass var. placidia Mass var. Oasis Mass var. erythrella (Ach) Jatta	= *Caloplaca ferruginea* (Huds.) Th. Fr. = *C. flavorubescens* (Huds.) Laund (Cl. &Roux, 1985) = *C. velana* (Mass.) Du Rietz = nrf = nrf = *Caloplaca velana* (Mass.) Du Rietz = *C. oasis* (Mass.) Szat. = *C. flavovirescens* (Wulfen) Dalla Torre & Sarnth
49. -- Caloplaca cerina (Ehrh) Th. var. cyanolepra Krb	= *Caloplaca cerina* var *cyanolepra* (DC) Kickx
50. -- Caloplaca pyracea (Ach) Th. var. confluens Mass. var. lactea Mass. forma macrocarpa (endemic) var. pyrithroma (Ach.) Nyl	= *Caloplaca holocarpa* (Ach.) Wade (note 12) nrf nrf nrf

51. -- Caloplaca marmorata Bagl var. cephaloidea Jatta (endemic)	= *Caloplaca marmorata* Bagl. Jatta = var. cephaloidea Jatta?
52. -- Caloplaca fulva (Anzi)	nrf
53. -- Diphratora Cesati Mass. Ricasolia Cesati var. grisea Bagl. var. olivacea Bagl	= *Solenopsora cesatii* (Massal.) Zahlbr. v. *cesatii* = *Solenopsora cesatii* v. *grisea* (Bagl.) Nimis nrf
54. -- Diphratora spadicea (Fw.) Jatta var. Gennari Bagl	nrf
55. -- Diphratora olivacea Duf	nrf
56. -- Lecaniella pseudocyrtella Anzi	nrf
57. -- Lecaniella Turicensis Mass	= *Lecania turicensis* (Hepp) Müll. Arg.
58. -- Lecaniella proteiformis Mass. var. lecideina Mass var.compacta Mass	nrf nrf
59. -- Lecaniella alocyza Mass var. flavidula (endemic)	= *Caloplaca alociza* (Massal.) Migula = var. *flavidula*?
60. -- Lecaniella dimorpha Mass	= nrf
61. -- Lecaniella polycycla Anzi.	= *Lecania polycycla* (Anzi.) Lettau? (note 13)
62. -- Lecania athroocarpa Dub	= *Lecania fuscella* (Schaerer) Körber
63. -- Lecania Koerberiana (Lhm) Krb	= *Lecania koerberiana* (Lhm)
64. -- Haematomma cismonicum Beltr	= *Loxospora cismonica* (Beltram) Hf
65. -- Rinodina metabolica (Ach.) Krb. var.maculiformis	= *Rinodina exigua* (Ach.) Gray
66. -- Rinodina albana Mass	= *Rinodina albana* (Mass.) Mass.
67. -- Pertusaria dealbata Ach	= *Pertusaria dealbescens* Erichs.
68. -- Pertusaria communis DC	= *Pertusaria pertusis auct.*
69. -- Pertusaria lejoplaca Ach.	= *Pertusaria leucostoma* (Bernh.) Mass.
70. -- Pertusaria leucostoma Mass	= *Pertusaria leucostoma* (Bernh.) Mass.
71. -- Urceolaria scruposa Ach. var. gypsacea Smrf. var. bryophila Schaer.	= *Diploschistes scruposus* (Schreber) Norman = *D. gypsaceus* (Ach.) Zahlbr = *D. muscorum* (Scop.) R. Sant (McCune, 2001)
72. -- Urceolaria actinostoma Pers. var. tectorum Mass	nrf nrf
73. -- Cladonia pungens Flk.	= *Cladonia rangiformis* Hoffm.
74. -- Cladonia muricata Del	nrf
75. -- Cladonia pyxidata (L) Fr. var. neglecta (Flk.) Krb. var. Pocillum (Ach.) Flk.	= *Cladonia pyxidata* (L) Hoffm. nrf = *Cladonia pocillum* (Ach) O.J. Rich
76. -- Cladonia fimbriata (L.) Fr.	= *Cladonia fimbriata* (L.) Fr.
77. -- Cladonia endiviaefolia (Dcks.) Fr.	= *Cladonia convoluta* (Lam.) Anders
78. -- Biatora decipiens (Ach.) Fr var. dealbata Mass.	nrf (note 14) nrf
79. -- Biatora coroniformis Krplh	nrf (note 14)
80. -- Biatora fusco-nigrescens Jatta (end)	nrf (note 14)
81. -- Biatora chondrodes Mass.	= *Clauzadea chondrodes* (Mass.) (Cl. & Roux, 1985)

82. -- Biatora cyclisca Mass	= *Clauzadea cyclisca* (Mass.) V. Wirth
83. -- Biatorina sylvestris Arnd	= *Lecania sylvestris* (Arnd.) Arnd
84. -- Biatorina lenticularis (Ach.) Krb var. ecrustacea (Krb.) Arnd	= *Catillaria lenticularis* (Ach.) Th. Fr. (Coppins, 2002) nrf
85. -- Bacidia atrogrisea (Hepp.) Krb.	= *Bacidia laurocerasi* (Duby) Zahlbr.
86. -- Bacidia rosella (Pers.) De Not.	= *Bacidia rosella* (Pers.) de Not.
87. -- Lecidea auriculata Th. var calcicola Jatta	(note 15)
88. -- Lecidea viridans Fw.	= *Lecidea viridans* (Fw.) Körber
89. -- Lecidea enteroleuca Ach.	= *Lecidella elaeochroma* (Ach.) Haszl
90. -- Lecidea olivacea Mass	= *Lecidella elaeochroma* (Ach.) Haszl
91. -- Lecidea glabra Krplh. var. viridula Arnd.	= *Lecidella stigmatea* (Ach.) Hertel & Leuckert ? (note 16)
92. -- Lecidea pertusariicola Jatta (endemic)	nrf
93. -- Thalloedema tabacinum (DC.) Mass.	nrf
94. -- Thalloedema paradoxum Jatta (endemic)	nrf
95. -- Thalloedema vesiculare (Hffm.) Mass. Biatorina vesicularis var. teretocarpum Mass	= *Toninia sedifolia* (Scop.) Timdal nrf
96. -- Thalloedema mammillare (Fr) Mass. var. pulchellum (endemic)	= *Toninia tumidula* (Sm.) Zahlbr. nrf
97. -- Toninia acervulata Nyl.	= *Toninia aromatica* (Sm.) Mass.
98. -- Toninia aromatica (Sm.) Mass,	= *Toninia aromatica* (Sm.) Mass
99. -- Toninia squalida (Ach.) Mass.	= *Toninia squalida* (Ach.) Mass.
100. -- Arthrosporum accline Krb	= *Arthrosporum populorum* Mass.
101. -- Scoliciosporum Doriae Bagl. var. decussatum (endemic)	nrf nrf
102. -- Buellia canescens (Dcks.) De Not	= *Diploicia canescens* (Dickson) Massal.
103. -- Buellia parasema (Ach.) Krb. var rugulosa (Ach.) Krb	nrf
104. -- Buellia punctata (Flk..) Krb.	= *Amandinea punctata* (Hoff.) Coppins & Scheid.
105. -- Diplotomma albo-atrum (Hffm.) Krb var. epilobium (Ach.) Schaer. et var. venustum Krb. var. corticola Schaer.	= *Diplotomma alboatrum* (Hoff.) Flotow = *D. epipolium* (Ach.) Arnold = *D. venustum* (Körb) Körb. = *D. alboatrum* (Hoff.) Flotow
106. -- Roccella tinctoria DC.	= *Roccella tinctoria* auct.non DC (note 17)
107. -- Roccella phycopsis Ach.	= *Roccella phycopsis* Ach.
108. -- Lecanactis lyncea (Sm.) Eschw.	= *Lecanactis lyncea* (Sm.) Fr.
109. -- Lecanactis Dilleniana (Ach.) Krb.	= *Lecanactis dilleniana* (Ach.) Krb. (note 18)
110. -- Lecanactis granulosa (Duf.) Fr	= *Lecanactis grumulosa* (Dufour) Fr.
111. -- Graphis dendritica Ach.; var. medusula Nyl.	= *Phaeographis dendritica* (Ach.) Müll. Arg. (Coppins, 2002) (note 19)
112. -- Graphis scripta (L.) Ach. var. recta (Hmb.) Krb. var. serpentina (Ach.) Schaer.	nrf = *Graphis scripta* (L.) Ach

113. -- Graphina sophistica Nyl var. Melitensis (endemic)	= *Graphina anguina* (Mont.) Müll. Arg var. *melitensis* ?
114. -- Opegrapha Duriaei Mtg. et Brck	= *Opegrapha durieui* Mont.
115. -- Opegrapha celtidicola Jatta	= *Opegrapha celtidicola* (Jatta) Jatta
116. -- Opegrapha varia Pers. var. notha (Ach.) Jatta. var. rimalis (Pers.) Ach. var. violatra (Mass.) Jatta.	= *Opegrapha varia* Pers. = *O. varia* Pers. = *O. varia* Pers. = *O. varia* Pers.
117. -- Opegrapha rupestris Fr. var. dolomitica Arnd	= *Opegrapha rupestris* Pers. = *O. rupestris* Pers.
118. -- Opegrapha herpetica Ach. var fuscata Schaer	= *Opegrapha rufescens* Pers. nrf
119. -- Opegrapha rubecula Mass.	= *Opegrapha rufescens* Pers.
120. -- Opegrapha lilacina Mass	= *Opegrapha rufescens* Pers.
121. -- Opegrapha atra (Pers.) Fr.	= *Opegrapha atra* (Pers.)
122. -- Opegrapha lithyrga (Ach.) Krb.	= *Opegrapha lithyrga* Ach.
123. -- Opegrapha siderella Aeh.	= *Opegrapha rufescens* Pers.
124. -- Opegrapha saxatilis DC	= *Opegrapha rupestris* Pers.
125. -- Opegrapha Mougeothii Mass. var. Pisana Bagl.	= *Opegrapha mougeotii* Mass. = *O. mougeotii* Mass.
126. -- Arthonia caesio-pruinosa Schaer.	= *Arthonia cinereopruinosa* Schaer. (note 20)
127. -- Arthonia galactites (DC.) Nyl.	= *Arthonia galactites* (DC.) Dufour
128. -- Arthonia apotheciorum (Mass.) Almg.	= *Arthonia clemens* (Tul.) Th. Fr.
129. -- Arthonia dispersa (Schrad.) Mass.	= *Arthonia dispersa* (Schrad.) Nyl.
130. -- Arthonia aspersa Lgth.	= *Arthonia arthonioides* (Ach.) A.L.Sm. (note 21)
131. -- Arthonia coniangioides Bagl	= *Arthonia melanophtalma* Dufour
132. -- Arthonia punctiformis Ach	= *Arthonia punctiformis* Ach
133. -- Arthonia epipastoides Nyl. Var. galactitella Nyl.	= *Arthonia radiata* (Pers.) Ach nrf
134. -- Arthonia mediella Nyl.	= *Arthonia mediella* Nyl.
135. -- Arthonia ectropoma Mass.	= *Arthonia dispersa* (Schrad.) Nyl.
136. -- Arthonia didyma Krb.	= *Arthonia didyma* Krb.
137. -- Arthothelium Ruanum Mass.	= *Arthothelium ruanum* (Mass.) Krb.
138. – Arthothelium Beltraminianum Mass.	= *Arthothelium ruanum* (Mass.) Krb.
139. -- Dirina Ceratoniae (Ach.) De Not	= *Dirina ceratoniae* (Ach.) Fr.
140. -- Dirina repanda (Fr.) Nyl.	= *Dirina massiliensis* Durieu & Mont. (Cl. & Roux,1985)
141. -- Endopyrenium rufescens (Ach.) Krb.	= *Heppia solorinoides* (Nyl.) Nyl.
142. -- Endopyrenium hepaticum (Ach.) Krb	nrf
143. -- Endopyrenium dedalaeum (Krplh) Krb	nrf
144. -- Endopyrenium Adriaticum Zahlbr.	nrf
145. -- Catapyrenium Custnani Mass.	= *Placidiopsis cartilaginea* (Nyl.) Vainio

146. -- Catapyrenium circinatum Bagl.	nrf
147. -- Dermatocarpon glomeruliferum Mass *Polyblastia glomerulifera*	= *Endocarpon pusillum* Hedwig
148. -- Verrucaria lecideoides Hepp. var. minuta Mass.	= *Verrucaria lecideoides* (Mass.) Trevisan = *V. minuta* (Hepp) Zsch.
149. -- Verrucaria hydreia Ach.	= *Verrucaria hydreia* Ach.
150. -- Verrucaria ruderum DC.	= *Verrucaria ruderum* DC.
151. -- Verrucaria papillosa Ach.	= *Verrucaria papillosa* Ach.
152 --Verrucaria rupestris Schrad. var. calciseda Schaer. et var. crassa Mass var caesia Arnd var. orbicularis Garov.	= *Verrucaria muralis* Ach. = *V. calciseda* auct. non. DC = *Thelidium decipiens* (Nyl.) Kremp.? (note 22) = *Pyrenocollema caesium* (Nyl.) R.C. Harris nrf
153. -- Verrucaria purpurascens Hffm.	= *Verrucaria marmorea* (Scop.) Arn.
154. -- Verrucaria muralis (Ach.) Mass.	= *Verrucaria muralis* (Ach.)
155. -- Verrucaria anceps Krplh	= *Polyblasta anceps* (Hepp.) Servít
156. -- Verrucaria myriocarpa Hepp.	= *Verrucaria murina* Leigh.
157. -- Verrucaria Baldensis Mass. var spilomatica Mass.	= *Bagliettoa baldensis* (Mass.) Vezda (note 23)
158. -- Verrucaria Veronensis Mass.	= *Verrucaria veronensis* Mass.
159. -- Verrucaria dolomitica Mass.	= *Verrucaria foveolata* (Flörke) Mass.
160. -- Verrucaria foveolata (Flk.) Mass	= *Verrucaria foveolata* (Flörke) Mass.
161. -- Verrucaria macrostoma (Duf.) DC.	= *Verrucaria macrostoma* DC.
162. -- Verrucaria tabacina Mass.	= *Verrucaria tabacina* (Mass.) Trev.
163. -- Verrucaria acrotelloides Mass.	= *Verrucaria acrotelloides* Mass
164. --Verrucaria apathela (Mass) Jatta;	= *Verrucaria apatela* (Mass) Trev.
165. -- Verrucaria fuscoatra (Wallr.) Krb var. controversa Mass. Verrucaria controversa CG var. collematodes Garov.	= *Verrucaria nigrescens* Pers. = *V. nigrescens* Pers. = *V. collematodes* Garov.
166. -- Verrucaria viridula Ach	= *Verrucaria viridula* (Schrad.) Ach
167. -- Verrucaria Beltraminiana Mass.;	= *Verrucaria beltraminiana* (Mass.) Trevis
168. -- Verrucaria fuscella Turn. var. cinereo-glauca Garov.	= *Verrucaria fuscella* (Turn.) Winch nrf
169. -- Verrucaria glaucina (Ach.) Hepp.	= *Verrucaria caerulea* DC
170. -- Verrucaria tristis Krypt. cum var. depauperata Mass.	= *Verrucaria tristis* (Mass.) Kremp.
171. -- Thelidium galbanum (Krplh.) Krb. var. acrustaceum Arnd	nrf
172. -- Thelidium crassum Mass	= *Thelidium decipiens* (Nyl.) Kremp.
173. -- Thelidium minutulum Krb.	= *Thelidium minutulum* Krb.
174. -- Thelidium epipolaeum (Ach.) Krb.	nrf
175. -- Polyblastia clandestina Arnd	= *Polyblastia clandestina* Arnd.

176. Acrocordia conoidea Krb. var. dimorpha Krb.	**= *Acrocordia conoidea* Krb. (note 24)**
177. -- Arthopyrenia analepta Ach	**= *Arthropyrenia punctiformis* (Pers.) Mass.**
178. -- Arthopyrenia cinereo-pruinosa Schaer.	**= *Arthropyrenia cinereopruinosa* (Schaer.) Mass**
179. -- Arthopyrenia punctiformis Fr.	**= *Arthropyrenia punctiformis* (Pers.) Mass.**
180. -- Sagedia oleriana Mass	**= *Porina oleriana* (Mass.) Lettau**
181. -- Pyrenula nitida (Schrad.) Ach.	**= *Pyrenula nitida* (Weig.) Belt. (note 25)**
182. -- Cyrtidula crataegina Mnks.	**nrf**
183. -- Cyrtidula occulta Mnks	**nrf**

Notes:

1. The binomial *Collema crispum* (Hudson) Wigg is given for *C. cheileum v. brutium* Jatta (Nimis, 1993).
2. The binomial *L. plicatile* being suggested here is actually for *Collemodium plicatile* (Ach.) Nyl. and not for *C. subplicatile*. The genus *Collemodium* is no longer in use.
3. No reference to *Collemodium turgidum* was found. Only *Collema turgidum* was traced with synonym *Leptogium turgidum* the latter being a dubious species (Nimis, 1993).
4. Synonym for *Xanthoria aureola* auct. (Clauz. & Roux, 1985) and not for *X. parietina* v. *aureola*.
5. The name *Ph. tenella* was frequently used by earlier authors for *Ph. adscendens*.(Nimis, 1993).
6. Sometimes the epithet "*obscura*"was used by earlier Italian authors for the more common *Phaeophyscia orbicularis* (Nimis, 1991). *Phaeophyscia orbicularis* var. *orbicularisis* is given by Clauzade and Roux, 1985 as a synonym for *Physcia virella* rather than for *Physcia obscura* var. *virella*.
7. The synonym *S. periculosa* was found for *Lecanora crassa* var. *periculosa*.
8. *S. lentigera* has a Mediterranean distribution and today is not "known only to Malta" as suggested in the original checklist (Nimis, 1993).
9. *Lecanora subfusca* is a difficult complex of lichens. Most Italian records of species of this complex should be regarded as dubious until checked (Nimis, 1993).
10. Jatta an several authors had a wrong concept of this species; records of *C. aurea* probably refer to a *Fulgensia* species (Nimis, 1993).
11. The name "*luteoalba*" was most frequently used by earlier Italian authors, including Jatta, to designate taxa of the *C. pyracea-halocarpa* complex (Nimis, 1993).
12. The *Caloplaca holocarpa-pyracea* complex is still in need of clarification; it includes different morphs, some of which might deserve to be treated at species rank (Nimis, 1993).
13. According to P.L. Nimis the *Lecaniella polycycla* var. *diffusa* Albo described by G. Albo (Albo, 1925) might be referring to *Lecania polycycla* though clarification of the taxonomic position of this taxon needs the examination of the type material (Nimis, 1993).
14. In the past the generic name Biatora was very extensively used for species which are now placed in a series of quite unrelated genera (Nimis, 1993).
15. This species has an arctic-(subarctic-) alpine distribution in Europe. The v. *calcicola* described from the island of Malta is probably not related to *Lecidea auriculata* (Nimis, 1993).
16. The synonym *L. stigmata* was found for *Lecidea glabra* only and not the variety *viridula*.
17. The existence of *R. tinctoria* in the Mediterranean region is dubious. Old Italian authors used this name for *Roccella phycopsis* (Nimis, 1993). According to J.M Egea (Egea,1989) the name *R. tinctoria* was frequently used for members of the *Roccella canariensis* complex.
18. This is a mountain lichen so records from the South of Italy are dubious (Nimis, 1993).
19. The synonym found was for *G. dendritica* only and not the variety *medusula*.
20. This species has probably a holarctic distribution. The records from Jatta from Southern Italy are dubious (Nimis, 1993).
21. Nimis (1993) refers to K. Redinger (Redinger,1938) who claims that the record of *A. aspersa* from Malta, by Jatta (1900) could most probably refer to *Arthonia melanophthalma* Dufour.
22. *T. decipiens* was found as a synonym of *Verrucaria crassa* and not of *V. rupestris* v. *crassa*.
23. *B. baldensis* was found as a synonym of *Verrucaria baldensis* and not of *V. baldensis* v. *spilomatica*
24. Found as synonym for *A. conoidea* only and not the variety *dimorpha*
25. No reference to the var. *nitidella* was found. *P. nitida* is found on upland areas (Nimis, 1993)

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SOME ADDITIONS TO THE MACROFUNGI OF MALTA

Michael Briffa[1]

ABSTRACT

Twenty two macrofungi are recorded for the first time as occurring in Malta: *Amanita echinocephala, A. gracilior, Volvariella murinella, Psathyrella spintrigera, Pluteus thomsonii, Pleurotus pulmonarius, Tricholoma caligatum, Mycena galericulata, M. alba, Lactarius atlanticus, L. tesquorum, Xerocomus dryophilus, Gyroporus castaneus, Omphalotus olearius, Macrotyphula juncea, Ramariopsis kunzei, Phellodon niger, Lycoperdon lividum, Myxarium nucleatum, Auricularia auricula-judae, Paxina leucomelas*, and *Peziza proteana* fma. *sparassoides*. The last one cancels and replaces previous erroneous records of *Sparassis laminosa*. Former records of *Psathyrella candolleana* are doubtful. The examined specimens together with their respective photographs, taken *in situ*, are deposited in the author's herbarium (MB).

INTRODUCTION

Throughout the eighties and the first half of the nineties I collected and preserved a considerable amount of material of macrofungi, mainly from the few wooded localities we have in Malta, classified it and recorded the respective data. I have also taken photographs *in situ* of practically all the specimens collected. However, in many cases I still find it difficult to have them accurately determined at species level.

Modern natural taxonomy is no longer based solely on spore-colour and simple macroscopic morphology. Sometimes accurate identification is a very difficult and painstaking process, involving a lot of microscopic analysis and the use of chemical reagents to distinguish between similar-looking or closely related species. Ideally identification should be left to competent, professional mycologists. Unfortunately, however, mycologists scarcely ever visit Malta, the literature we have available is very limited, we lack expensive sophisticated equipment, and most of all we have no local professional expertise.

One of the main problems I have experienced is the fact that most of the material collected is preserved in 9% formaldehyde, in glass jars, which are unsuitable for mailing to expert colleagues abroad. In this condition the material cannot be tested with chemical reagents, and its smell and taste cannot be perceived. It can only be examined microscopically.

Local efforts at identification were first attempted in the first half of the eighties when a good number of the collected specimens of species not yet recorded in Malta were published in Briffa & Lanfranco (1986). In the case of polypores, the material could be easily dried, and the exsiccata were later examined and determined by polyporologists abroad and published in Briffa (2001).

In the present work some previously unrecorded species, which could now be determined with reasonable certainty, are published. Their identification is based on the actual herbarium material as described here, the respective photographs and the recorded field observations. In a few cases where exsiccata were available, help from mycologists abroad was sought and obtained.

The species being published here are new records for Malta, meaning they do not appear in the local literature published by Zerapha S. (1831), Gulia G. (1859), Borg G. (1899), Borg G. (1901), Saccardo, P.A. (1912), Saccardo, P.A. (1913), Saccardo, P.A.(1914), Sommier, S. & Caruana Gatto A. (1914), Borg J. (1922), Lanfranco E. (1972), Briffa M. & Lanfranco, E. (1986) , and Briffa M. (2001).

Considerable, outstanding, old material in my herbarium belonging to the genera *Amanita, Agaricus, Lepiota* (and allied genera), *Coprinus, Psathyrella, Inocybe, Pleurotus, Marasmius, Mycena, Tricholoma, Clitocybe, Hygrocybe, Russula, Boletus, Suillus, Xerocomus, Peziza* and other Ascomycete genera is still awaiting accurate identification at species level.

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THE NEW RECORDS

CLASS HYMENOMYCETES

ORDER AGARICALES

Family Amanitaceae

1. *Amanita echinocephala* (Vitt.) Quél.

Material examined: MB365, Ballut tal-Wardija Malta, 1.11.93, under *Quercus ilex.*

This sizeable specimen had a white, outstretched pileus (diam. c. 9cm), adorned with conical scales; white, free gills and a white stipe (c. 9 X 2cm) which included a membranous ring and a bulbous, turbinate, deeply rooting base (diam. 3.5cm), surrounded by bands of scales. Its white, ellipsoid spores measured c. 10 X 6µ.

The peculiar, conical, thorn-like scales on the pileus, as implied by its specific name, were sufficient to lead to its identification in the section *Lepidella* Gilb. A similar looking species is *A. boudieri,* a Mediterranean species, which according to Cetto (1994) only appears in Spring.

2. *Amanita gracilior* Bas & Honrubia

Materal examined: MB346, Wied Hazrun Malta, 2.11.84 near *Erica multiflora* not far from a grove of *Quercus ilex.*

The specimens had a somewhat viscose, white, outstretched pileus with a diameter of c. 6cm, adorned with some small scales in the centre ; white, almost free gills; white flesh, and a stipe c. 10cm long 2cm wide at the apex and ending in a buried turbinate, rooting, bulbous base 4.5 X 3.5cm. The white spores contained oil drops or granules, and measured c. 10-11.5 X 5-6um.

Had it not been for its peculiar spores and viscose pileus, this species could easily have been mistaken for *A. boudieri,* which has almost identical morphological features. In fact, Cetto (1994) says *'A. gracilior* is a species that can be considered as the autumn form of *A. boudieri* which appears in spring.'

Family Coprinaceae

3. *Psathyrella spintrigera* (Fr.) Konr. & Maubl.

Material examined: MB027, Verdala Park, Malta, 10.11.82, on litter of *Cupressus, Olea* and *Nerium.*

The specimens could be easily recognized by their reddish-brown or date-coloured pileus with a diameter up to c. 5 cm with a paler crown, decorated with cottony white scales; their white floccose, fistulose stipe c. 5 X 0.5cm; and oval spores measuring c. 7 X 5µ.
This record had been erroneously published as *P. candolleana* in Briffa and Lanfranco (1986). The authors may have had a mistaken concept of *P. candolleana.* Mature specimens appearing on photographs of at least three others of its supporting records did not have a white pileus.

ORDER PLUTEALES

Family Pluteaceae

4. *Volvariella murinella* (Quél.) Moser

Material examined: MB130, Buskett Malta, 5.12.86, on pine needles under *Pinus halepensis.*

The specimens had a silky, grey, convex pileus, c. 2cm, expanding to c. 3cm; pale pink, rather crowded, almost free gills; and white stipe, c. 3cm X 6mm, with a lobed, white volva. The ellipsoid, pink spores measured 6.5- 7.8 X 4.5µ.

The size of the carpophore, the mouse-grey pileus, the lobed, white volva, and the spore dimensions are indicative of this species, even though according to Moser its normal habitat is 'meadows, pasture and waysides'.

5. *Pluteus thomsonii* (Berk. & Br.) Dennis

Material examined: MB367, Wied il-Luq, Malta, 16.10.95, on dead remains of *Laurus nobilis.*

The specimen could be easily identified by the peculiar morphological features of its pileus. The small grey pileus, with a diameter of 2cm, was adorned by conspicuous reticulate irregular ridges or veins in the centre and a striate margin. The gills were pinkish white, free and slightly dentate; the stipe was also grey covered with white flakes; and the spores were pink in mass and measured c. 8 X 5.5µ.

ORDER TRICHOLOMATALES

Family Pleurotaceae

6. *Pleurotus pulmonarius* (Fr.) Quél. (Fig. 1)

Material examined: MB369, 'Wied tal-Isqof Malta, 23.3.02, on main trunk and branches of a dead *Morus nigra.*' Leg. D. Dandria.

This unfamiliar specimen was a thin, flat, whitish, gilled, bracket fungus, with a negligible, rudimentary, lateral stipe. It carried elongated, hyaline spores (9-10 X 4-4.5µ), typical of the genus *Pleurotus* as compared with *Crepidotus.* It was examined by Moreno, who said 'The absence of a hymenial veil, and the variable morphology of the cheilocystidia are indicative of *Pleurotus ostreatus* s. lato'. (personal communication) However, the specimen did not match the description of *P. ostreatus* s.str., which is normally much fleshier and has a very dark pileus. It was subsequently determined as *P. pulmonarius,* which belongs to the *ostreatus* group. Its identification was based on the following: Bon (1987), comparing *P. pulmonarius* with *P. ostreatus* says: *'P. pulmonarius* is thinner and flatter, with

cap pale beige to whitish'. Referring to *P. pulmonarius*, Moser (1983) says : 'cap milky to ivory-white..... sometimes yellowing when dying'. Photos taken by the collector *in situ* depict aging carpophores, which were turning yellow, and which were similar to the examined specimen and on the same substrate. Moreno agreed, with the identification and confirmed there are no microscopic differences between *P. pulmonarius* and *P. ostreatus*. A final proof would have been its aniseed smell.

Family Tricholomataceae

7. *Tricholoma caligatum* (Viv.) Rick.

Material examined: MB351, Il-Bosk (Buskett) Malta, 11.12.86, under *Pinus halepensis*.

The specimens had a fleshy pileus (diam. c. 5cm) with dark brown scales on paler background and with a whitish involute margin, becoming outstretched later; white, sinuate gills; full stipe (5 X 2cm), white at apex above the ring and concolourous with pileus in the 'booted' end which comprised the ring; white flesh; and white, smooth, shortly elliptic spores measuring 5.5 - 6.5 X 4.5 - 5.5µ. The dimensions of the pileus and stipe were smaller than those described in Moser (1978), and Bon (1987), but the specimen collected was the smallest from a group of 6, chosen for storage convenience. The dimensions of the spores, however, and the other morphological features were typical of the species.

Family Marasmiaceae

8. *Mycena galericulata* (Scop.) S.F. Gray

Material examined: MB198, Ballut tal-Wardija Malta 3.12.86, on dead branch of *Ceratonia siliqua*.

These relatively sizeable specimens had a pale greyish-brown, wrinkled to striate, umbonate pileus, up to a diameter of 4.5cm when expanded; whitish to pale pinkish, ventricose, somewhat distant, interveined gills; and a firm light greyish-brown, fistulose, rooting stipe, brown at base, c. 10 X 0.4cm. The white spores were elliptic, measuring c. 10-11 X 6-7µ

9. *Mycena alba* (Bres.) Kühn. (= *M. corticola* Bres. non Pers.)

Material examined: MB136, Ballut tal-Imgiebah Malta, 10.2.86, gregarious on bark of a living *Quercus ilex*..

These minute carpophores had a white pileus (up to 6mm diam.), distant, white gills, a thin, white stipe (up to 8mm long), and round spores (c. 6µ) with a prominent apiculus. Their small size, colour, habit, habitat (as implied by the old and new specific name), and spore dimensions, were indicative of the species.

ORDER RUSSULALES

Family Russulaceae

10. *Lactarius atlanticus* Bon

Material examined: MB501, Ballut tal-Wardija Malta, 15.11.84, at base of *Quercus ilex*.

This species with an orange-red pileus, concolourous stipe and pale ochre, crowded gills belongs to the *Lactarius* section *Olentes*, with watery milk, (Bon 1987), and is associated exclusively with *Qercuus ilex*. The specimens were examined and determined in 1993 by Marcel Bon, the

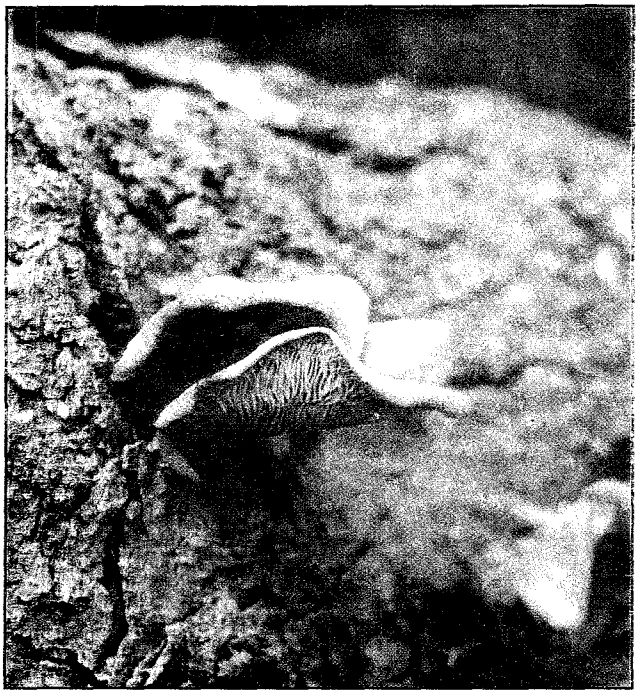

Fig. 1 *Pleurotus pulmonarius* (Fr.) Quél.

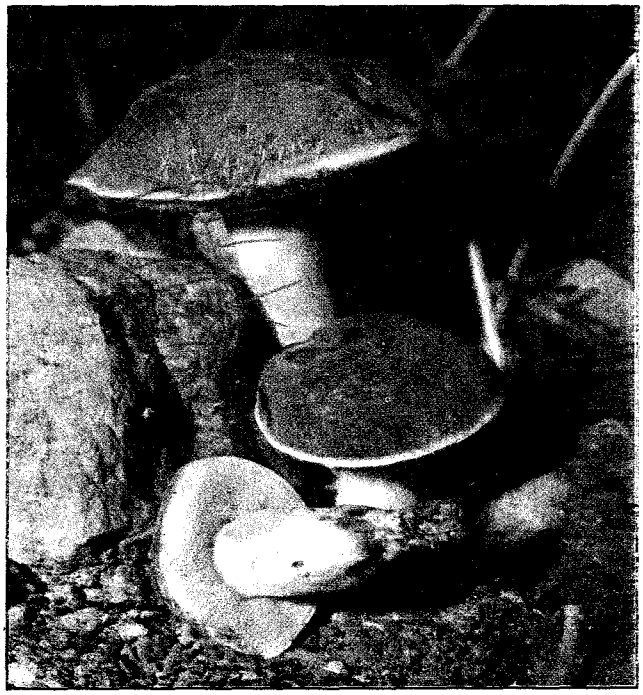

Fig. 2. *Xerocomus dryophilus* (Thiers) Singer

author of the species himself. He said, "after 9 years the exsiccata still retained a fragrant smell of chicory despite their age; the spores were globular, ca. 8µ, reticulate and subechinulate at the junction of the cells; and the lactiferous hyphae were clearly visible in SF (sulphoformol).'

11. *Lactarius tesquorum* Mal.

Material examined: MB249, Ta Wied Rini Malta, 17.12.93, under *Cistus monspeliensis.*

The specimens had an orange, tomentose pileus with no sign of zonation; white, crowded gills turning very pale pink; a short, fistulose stipe, attenuate towards the base, concolourous with pileus; white flesh; white latex, and white, reticulate, subglobose spores measuring c. 7-8 X 6-7µ. The taste was sharply peppery.

According to Cetto (1993), this species is almost identical with *L. mairei,* however, whereas *L. tesquorum* is confined to the Mediterranean zone and is only associated with *Cistus* species, *L. mairei* has also been reported from continental Europe and is associated with frondose trees.

ORDER BOLETALES

Family Boletaceae

12. *Xerocomus dryophilus* (Thiers) Singer (Fig. 2)

Material examined: MB339, Ballut tal-Imgiebah, Malta, 7.11.84, under *Quercus ilex.* [This collection had been published as *Xerocomus chrysenteron* in Briffa and Lanfranco (1986)].

The specimens had a lightly velutinate, reddish, convex pileus (c. 4.5cm), expanding but not becoming fully outstretched, with a distinctly whitish margin, and becoming paler and glabrous on maturity; yellow tubes less than 1 cm; yellow pores c. 1 mm.; the stipe (c. 5 X 1.2cm), yellow above and dark reddish below with a narrowed or pinched base; and ellipsoid spores measuring (13.7) 14.3-15.0 (15.6) X 5.9-6.5µ.

It is with some hesitation that this species has been included in this paper owing to its close affinity with *X. rubellus* s.l., which is also chiefly associated with *Quercus* species, as re-described unofficially by Engel et al. (1990 & 1996 in Simonini 1998) under the provisional name of *X. 'quercinus'.*

A constantly recurring characteristic of the Maltese specimens is the distinctly broad whitish margin of the pileus. This, however, is not included in Tiers' official definition of the species (in Simonini 1998). The relative photograph published by Simonini (1998), nevertheless, looks identical with the Maltese material and includes the distinctive whitish margin, even though no mention of it is included in the text. On the other hand, Cetto's description of *Boletus 'amaranthus'* nom. prov., (1989 - 1994, No.2461), which according to Simonini is the same species as *X. dryophylus,* mentions the white margin; but this is not so obvious in his published photograph of the species. Engel *et al.* (1990) mention a greyish-white margin on the pileus of *X. 'quercinus'.* (= *X. rubellus* s.l. sensu Simonini 1998).

The distribution and ecology of *X. dryophilus* favour its occurrence in Malta. Simonini (1998) says that in Europe its distribution seems to be restricted to the Mediterranean region and it only occurs in a strictly calcareous and xerophilous environment, associated with *Quercus* species.

13. *Gyroporus castaneus* (Fr.) Quél.

Material examined: MB343, Ballut tal-Imgiebah, Malta, 29.12.94, under *Quercus ilex.*

This specimen could be easily distinguished from other difficult species of the *Boletaceae* family. It had a mustard pileus; white, roundish pores, 1-2/mm , gradually turning ochre with age; white tubes, gradually becoming ochre, on a white base; a fragile, chambered or fistulose bulbous, stipe, tapering upwards, concolourous with the pileus; white flesh, not discolouring when handled; and ovoid, lemon-yellow spores, measuring c. 10 X 6 µ. The only other species of this genus is *G. cyanescens*, which turns blue when handled.

Family Paxillaceae

14. *Omphalotus olearius* (DC: Fr.) Sing.

Material examined: MB804, It-Tafal tal-Imdina, below Saqqaja Malta, 'Early November 1995, c. 30 cm up trunk of *Olea europaea,*' leg. Ch. Galea-Bonavia.

This specimen, with a brownish-orange, slightly depressed, umbonate pileus (c. 7 cm); bright orange, strongly decurrent gills; concolourous flesh; and a full, eccentric stipe with a blackish base, was easily recognisable, by its habitat, its morphological features, and its subglobose spores (c. 5 - 6µ).

ORDER CLAVARIALES

Family Clavariaceae

15. *Macrotyphula juncea* (Fr.) Berthier

Material examined: MB142, Ghajn il-Kbira Malta, 28.12.91, on decaying leaves of *Eriobotrya japonica.*

This species is easily recognisable by its habit and habitat. The specimens consisted of unbranched, smooth, filiform carpophores measuring c. 5 - 6 cm X 1-1.5mm, mostly pointed at the apex, coloured white above and pale brownish below, and hairy at the base.

16. *Ramariopsis kunzei* (Fr.) Corner

Material examined: MB369, Ballut tal-Wardija Malta, 16.1.96, at base of *Ceratonia siliqua* .

The specimens were whitish to cream carpophores 3.5cm

tall, consisting of a basal stipe from which emanated cespitose, ramifying branches, c. 2 mm thick, with pointed or blunt ends. Their colourless, finely decorated round spores with an apparent polygonal outline measured c. 4 - 5 µ.

ORDER APHYLLOPHORALES

Family Thelephoraceae

17. *Phellodon niger* (Fr.) Karst.

Material examined: MB103, Il-Bosk (Buskett), Malta, 11.12.86, under *Pinus halepensis.*

The specimens could be easily recognized by their conspicuous, coarse, invariably blackish, pileus with a white margin and their black flesh, contrasting with their greyish white verrucose hymenium underneath.

CLASS GASTEROMYCETES

ORDER LYCOPERDALES

Family Lycoperdaceae

18. *Lycoperdon lividum* Pers.

Material examined: MB310, Ta Wied Rini, Malta, 22.11.82, on open ground.

The specimen consisted of a subglobose to slightly pyriform carpophore, measuring c. 2 X 2 cm; a short, rooting stipe, measuring c. 5mm ; a shining, very light greyish brown, finely verruculose endoperidium; whitish to light yellowish brown gleba; and globose verruculose spores measuring 3.5-4.5um.

CLASS PHRAGMOBASIDIOMYCETES

ORDER TREMELLALES

Family Tremellaceae

19. *Myxarium nucleatum* Wallr. (= *Exidia alboglobosa* Lloyd)

Material examined: MB70, Near Addolorata Cemetery Malta, 12.12.83, on a decaying dead branch of *Celtis australis.*

The examined material consisted of snow-white, transparent, gelatinous, mostly confluent, subglobose carpophores, as implied by one of the former specific names of the species: *Exidia alboglobosa.* Microscopically, the basidia had long sterigmata, and the allantoid spores measured c. 11 X 4µ.

ORDER AURICULARIALES

Family Auriculariaceae

20. *Auricularia auricula-judae* (L.) Schroet.

Material examined: MB102 (in formaldehyde), Wied il-Luq, Malta, 10.11.94, on dead branches of *Carya sp.* MB657 (exsiccata), Wied il-Luq, Malta, 6.4.98, on unidentified dead twigs.

These specimens, bell-shaped or ear-shaped, with a velutinate, tawny outer surface and a shining, light violet-brown inner surface, were easy to identify by their peculiar translucent, firm, elastic, pliant texture. When dried, the specimens of MB657 became hard, whitish and hoary outside, and blackish blue inside. This is a common cosmopolitan species which, however, had never been reported from Malta.

CLASS ASCOMYCETES

ORDER PEZIZALES

Family Helvellaceae

21. *Paxina leucomelas* (Pers.) Kuntze
(= *Helvella leucomelaena* (Pers.) Nannf.)

Material examined: MB148, Mizieb Malta, 5.2.85, on pine needles under *Pinus halepensis.*

The specimens were generally shapeless or cup-shaped, 1.5 to 3.5 cm across, with perforations in the larger carpophores, a dentate margin, a very pale greyish outer surface and a very dark greyish inner surface. From their short, relatively thick, white stipe emanated short ribs which did not spread on to the cup's outer surface as in *P. acetabulum.* The asci measured c. 288-304 X 14-15µ; and the large elliptic smooth spores were generally monoguttate (with one oil-drop) and measured c. 20-23 X 11-13µ.

Family Pezizaceae

22. *Peziza proteana* (Boud.) Seaver fma. *sparassoides* (Boud.) Korf.

Material examined: MB180, Hal-Farrug Malta, 8.12.1982, near burnt stump of *Ceratonia siliqua.*

This specimen, a sub-globose mass of whitish fleshy fungal folds with faint shades of violet-brown, (diam. c. 23cm), together with two other identical specimens from different localities, (5.12.1983, Wied Ghollieqa Malta, near burnt stump of *Ceratonia siliqua,* and 23.11.1984, Wied Hazrun Malta, near burnt stump of *Quercus ilex.*), had been erroneously recorded as *Sparassis laminosa* in Briffa and Lanfranco (1986). The error was detected when the specimen was subsequently examined microscopically and was found to carry asci! The asci (c. 208-220 X 10µ attenuate towards the base) were interspersed with thin straight paraphyses, slightly clavate at the apex, and the ellipsoid, white spores measuring 10.4-11.7 X 6.5µ were biguttate (with two oil-drops) and distinctly verruculose.

The specimen was determined as *Peziza proteana* (Boud.) Seaver fma. *sparassoides* (Boud.) Korf., a carbonicolous species, having a superficial resemblance to *Sparassis*

laminosa. Its macroscopic and microscopic features agree with the descriptions in Cetto (1994 VI No. 2457) and Dennis (1960, p. 16), except for the asci which were rather shorter.

This form must have proved rather enigmatic to earlier mycologists. Originally it had been regarded as a sessile *Gyromitra* species (*G. philipsii* Massee). A summary of its interesting taxonomic history follows its description in Dennis (1960).

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A CONTRIBUTION TO THE FRESHWATER MACROALGAL FLORA OF THE MALTESE ISLANDS

Edwin Lanfranco[1]

ABSTRACT

A number of freshwater macroalgae are recorded for the first time from the Maltese Islands. These are: *Tetrasporidium lundii, Palmella miniata, Stigeoclonium tenue, Monostroma bullosum, Spirogyra parvula, Spirogyra* cf. *occidentalis, Klebsormidium* cf. *flaccidum, Tolypella glomerata, Vaucheria geminata, Vaucheria mulleola* and *Vaucheria verticillata.* Of these the most biogeographically important are *Tetrasporidium lundii* which constitutes the first record for Europe and the Mediterranean area and *Vaucheria mulleola,* which was previously known only from Swedish Lapland.

INTRODUCTION

Knowledge of Malta's freshwater algal flora is still rather fragmentary. The basic text outlining the Maltese species is the list of algae given by Sommier & Caruana Gatto (1915) in which reference is also made to the few previous records. Subsequent records of macroscopic freshwater algae are given by the author (Lanfranco, 1967, 1969, 1979). For the purpose of this contribution I have regarded as macroscopic those algae which have a definite structure, e.g. filaments or consistent gelatinous colonies, visible to the unaided eye, even when determination required optical aid. Several more remain unreported, especially in the genera *Oedogonium, Bulbochaete, Spirogyra, Zygnema* and *Mougeotia* which, while frequent in Malta, require the presence of fertile material for identification down to species level. Materials of all the taxa recorded here are deposited in the author's herbarium at the Department of Biology of the University of Malta.

SPECIES LIST

DIVISION: CHLOROPHYTA
Sub-Division: Chlorophytina
Class: Chlorophyceae .

Family: Palmellopsidaceae

Tetrasporidium lundii R.S. Pandey, Tiwari & D.C. Pandey (Plate 1)

Material examined: Wied il-Qlejgħa: 5.01.1967 (leg. Edwin Lanfranco); Fiddien: 13.11.1976 (leg. Edwin Lanfranco), 30.12.1988 (leg. Edwin Lanfranco & Jennifer Mallia); Wied is-Seqer (Gozo): 10.01.1993 (leg. Edwin Lanfranco & Shirley Micallef (mixed with *Monostroma bullosum*).

First recorded by the present author under the erroneous determination *Prasiola* sp. (Lanfranco, 1967) from Wied il-Qlejgħa (Chadwick Lakes) and simply as "palmelloid green alga" in a pictured key to freshwater plants (Lanfranco, 1979) produced for the use of biology teachers. More recently met with at Wied is-Seqer in Gozo, where it was accompanied by *Monostroma bullosum.* The specimens were determined by Dr. Pierre Bourrelly. This species was first described in 1980 from Allahabad district (India) (Pandey *et al.*, 1980 as quoted in Ettl & Gärtner, 1988). It seems that there are no records from Europe and the Mediterranean area. Occurs in early winter in water courses where it seems to thrive best in slow to moderately fast moving water, anchoring itself to the rocky or other substrates. The young plants start off being tubular, but the tubes generally split to form an *Ulva*-like body. Material is deposited in the author's herbarium at the Biology Department, University of Malta, at the British Museum (NH) and the Paris Natural History Museum.

Family: Palmellaceae

Palmella miniata Liebl. (Plate 1)

Material examined: Wied Ħarq Ħamiem: 16.01.1977 (leg. Edwin lanfranco); Għajn Riħana: 24.01.1980 (leg. Edwin Lanfranco).

Forms amorphous gelatinous masses, usually reddish, amidst moist vegetation; particularly in small depressions on rocky ground. Not uncommon.

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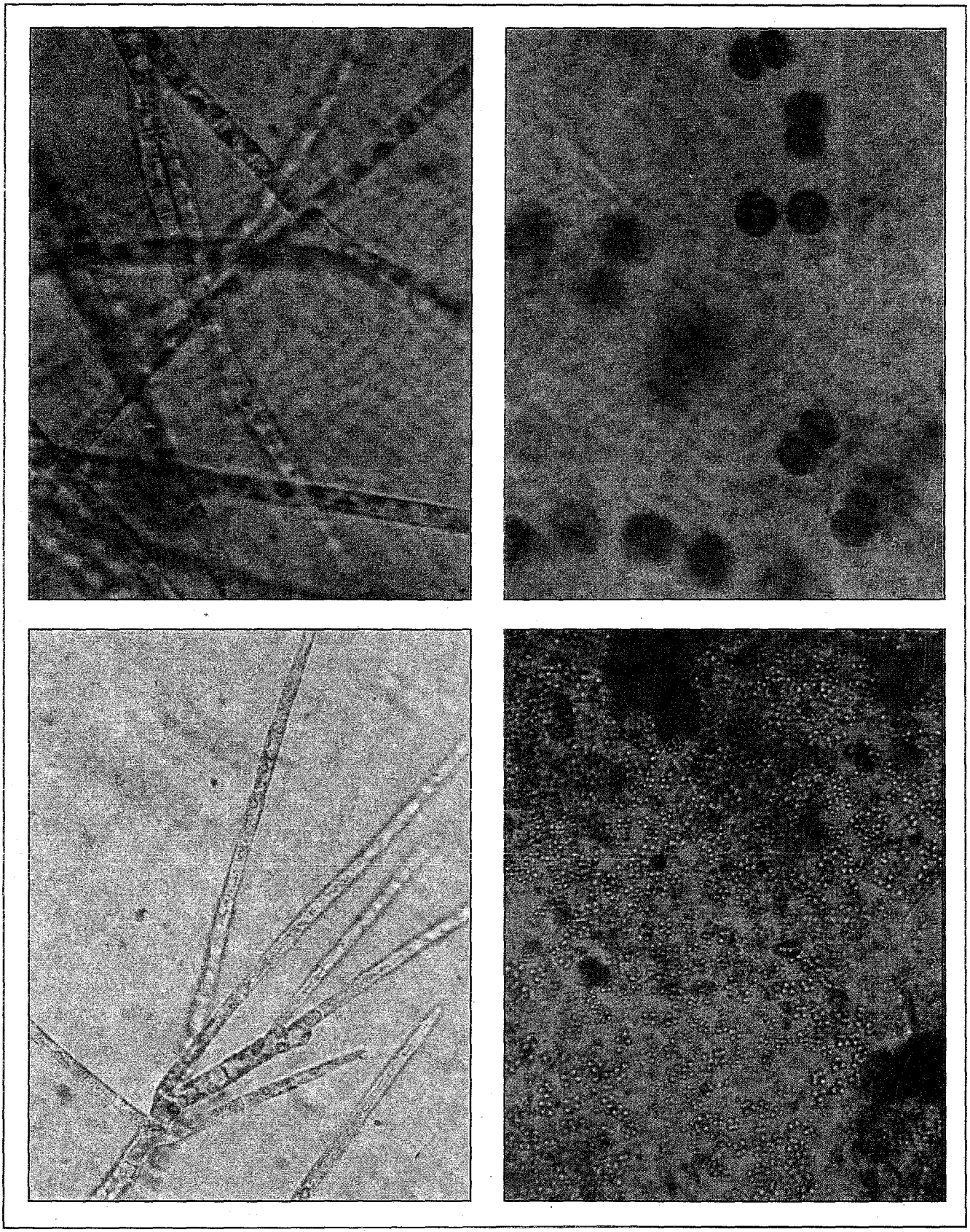

Plate 1. Top left: *klebsormidium* cf. *flaccidum* (cell diam. 7-8 micrometres); Top right: *Palmella miniata* (cell diam. 10-14 micrometres); Bottom left: *Stigeoclonium tenue*[cell diam. (main axis): 7 micrometres]; Bottom right: *Tetrasporidium lundii* (cell diam: c. 10 micrometres).

Family: Chaetophoraceae

Stigeoclonium tenue (C.A. Agardh) Kützing (Plate 1)

Material examined: Sliema: 29.06.1978 (leg. Edwin Lanfranco) in water-filled bowl.

So far only known from one record, but is easy to overlook and may actually be fairly frequent. Identification is based on Nurul Islam (1963).

Sub-Division: Ulvophytina
Class: Ulvophyceae

Family: Monostromataceae

Monostroma bullosum (Roth) Wittrock

Probably rare. So far only found once at Wied is-Seqer (Gozo) where it was growing in a well aerated pool fed by the water course. Most of the plants were more or less globose and several were floating in the pool. It was accompanied by *Tetrasporidium lundii* which it superficially resembles. Material is deposited at the Paris Natural History Museum.

Specimens examined: Wied is-Seqer (Gozo): 10.01.1993 (leg. Edwin Lanfranco & Shirley Micallef) mixed with *Tetrasporidium lundii.*

Class: Gamophyceae (= Zygophyceae, Conjugatophyceae)

Family: Zygnemaceae

Spirogyra parvula (Transeau) Czurda [= *S. catenaeformis* (Hassall) Kützing v. parvula Transeau]

Material examined: Għajn Rihana: 08.04.1978 (leg. Edwin Lanfranco).

Fertile material was encountered forming pure stands in slowly moving water at Għajn Rihana. The vegetative filaments had a diameter of 25µ while the dimensions of the smooth zygospores were 42µm x 30µm. Identification is based on Czurda (1932).

Family: Zygnemaceae

Spirogyra* cf. *occidentalis (Transeau) Czurda (= *S. velata* Nordsted v. *occidentalis* Transeau)

Material examined: Hemsija: late 06.1978 (leg. Edwin Lanfranco).

Record from still water of the Hemsija valley where it was mixed with a *Cladophora* sp. Specimens seen had two chloroplasts per cell. Filaments in material examined had a diameter of 49µm. Identification, which is tentative since material was sterile, is based on Czurda (1932).

Class: Klebsormidiophyceae

Family: Klebsormidiaceae

Klebsormidium* cf. *flaccidum (Kützing) S. Mattox & Blackwell (Plate 1)
[= *Hormidium flaccidum* (Kutzing) Braun, *Chlorhormidium flaccidum* (Kützing) Fott]

Material examined: Sliema: 29.05.1978 (leg. Edwin Lanfranco), in jar filled with rain water.

Frequent in ephemeral water bodies and in subaerial conditions. Identification to species level is tentative, and more than one species may be involved. First recorded as *Hormidium* sp. by the author (Lanfranco, 1969, 1979).

Class: Charophyceae

Family: Characeae

Tolypella glomerata (Desvaux) von Leonhardi

Material examined: Bajda Ridge: 18.02.1969 (leg. Edwin Lanfranco) in karst pool; Ta' Cenċ (Gozo): 25.02.2001 (leg. Edwin Lanfranco & Darrin T. Stevens) in karst pool; San Pawl tat-Tarġa: 24.03.2002 (leg. Edwin Lanfranco & Sandro Lanfranco) in karst pool.The only *Tolypella* recorded from the Maltese Islands is *T. nidifica* (O. Müller) von Leonhardi f. *condensata* A. Braun, the specimens being determined by L. Formiggini (Sommier & Caruana Gatto, 1915). This taxon has a predominantly Northern European distribution, particularly in the Baltic region (Stewart & Church, 1992) but also extends to reach the Mediterranean coast of France (Corillon, 1957). However all material examined has keyed out as *T. glomerata* which is much more widespread and is well known in the Mediterranean area. (Corillon, *op.cit.*). Since the two taxa are fairly similar, the original record for *T. nidifica* may be a misidentification, although its actual presence cannot be dismissed. *T. glomerata* occurs fairly frequently in rainwater pools (kamenitzas) which form on coralline limestones.

DIVISION: HETEROKONTOPHYTA
Class: Tribophyceae (= Xanthophyceae)

Family: Vaucheriaceae

Vaucheria geminata (Vaucher) DC.

Material examined: Wied Guno (Gozo): 07.04.1999 (leg. Edwin Lanfranco & Shirley Micallef) in pool along valley.

Fertile material of this hitherto unrecorded species was encountered at Wied Guno (Gozo). Material was also collected from a pond at Bugibba on 17.01.2000 by Dr. Roy Merritt (personal communication 21.02.2000).

Vaucheria mulleola Skuja

Collected from a pond at Bugibba on the 17.01.2000 by Dr. Roy Merritt (personal communication 21.02.2000). This species was originally described from Swedish Lapland (Skuja, 1964) and it seems that it has not been recorded from anywhere else (Dr. Roy merritt, personal communication 19.11.2002).

Vaucheria verticillata Kützing

Collected from a pond at Bugibba on the 17.01.2000 by Dr. Roy Merritt (personal communication 21.02.2000).

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INTRODUCTION AND ESTABLISHMENT OF *PHRYNETA LEPROSA* (FABRICIUS) (COLEOPTERA, CERAMBYCIDAE) IN MALTA

David Mifsud[1] and David Dandria[2]

ABSTRACT

The accidental introduction and establishment of *Phryneta leprosa* (Fabricius, 1775) in the Maltese Islands is recorded for the first time outside of its native distributional range. This species has been reported as a major pest of *Castilloa* and *Chlorophora* in tropical Africa. In the Maltese Islands the species is reported to be well established in the Rabat area, where heavy infestations were observed on trees of black mulberry, *Morus nigra*.

INTRODUCTION

A major factor contributing to the endangering and impoverishment of biodiversity, second only to habitat loss, is the unnatural introduction of organisms into new environments. Through such introduction, both accidental and deliberate, many organisms are transported around the world, a small percentage of which become established in new territories. In their new habitats, alien species that manage to establish themselves may have fewer predators, diseases and natural enemies in general and their population often grows out of control. Such alien species may also have adverse effects on local and regional economy, often involving severe damage in the agricultural, forestry and other related sectors.

Members of the beetle family Cerambycidae, are definitely no exception to introduction and establishment in new territories outside of their native range. The eucalyptus borer, *Phoracantha semipunctata* (Fabricius), is native to Australia, where it occurs throughout Eucalyptus forests with damage usually restricted to dead and dying trees. *P. semipunctata* is now almost cosmopolitan in distribution, and is found in practically all countries where Eucalyptus has been introduced. The main cause for its rapid spread is the transportation of Eucalyptus wood to different regions. In the Mediterranean basin, rapid spread of *P. semipunctata* (Fabricius) was favoured by the poor state of many Eucalyptus plantations, mainly due to drought and poor soils along with the great dispersal capability of the beetle (Cadahia, 1986). The brown spruce longhorn beetle, *Tetropium fuscum* (Fabricius), is native to Eurasia (found in northern and central Europe, from Scandinavia to Turkey, western Siberia and Japan) where it is a relatively innocuous pest. In 1990, the species was reported in Canada. This was the first established population of *T. fuscum* in North America, where authorities consider this insect as being responsible for the deteriorating condition and subsequent death of apparently healthy red spruce trees (Smith & Humble, 2000). Red spruce is an extremely valuable resource for pulp, paper and lumber production. The Asian longhorn beetle, *Anoplophora glabripennis* (Motschulsky) is native to Japan, Korea, the Malaysian peninsula and south-eastern China. In Asia, this insect develops primarily in dead or diseased elms, poplars, willows and fruit trees. The insect was first discovered in New York, U.S.A. (probably imported in the larval stages mining in the timber of wooden crates and support braces used to transport maritime cargo from Asia) in 1996 and since then, it has been found in shipments of forest products in California, South Carolina and Canada. *A. glabripennis* (Motschulsky) is a major hardwood pest and the effect on the timber and maple syrup industries in North America can be catastrophic (Carey *et al.*, 1998).

The present work is intended to document the introduction and establishment of *Phryneta leprosa* (Fabricius) in the Maltese Islands. This is the first record of this longhorn beetle becoming established outside its native range.

Phryneta leprosa (Fabricius, 1775)

Phryneta leprosa (Fabricius) is a member of the tribe Phrynetini within the sub-family Lamiinae. Currently, some 30 described species are included in the genus *Phryneta*, with distributions recorded in tropical Africa, Madagascar and Western India (Adlbauer, 1990). *P. leprosa* (Fabricius) is distributed from Sierra Leone to Angola and Tanzania (Breuning, 1937; Adlbauer & Mourglia, 1999). In Africa, the species generally attacks only damaged or unhealthy

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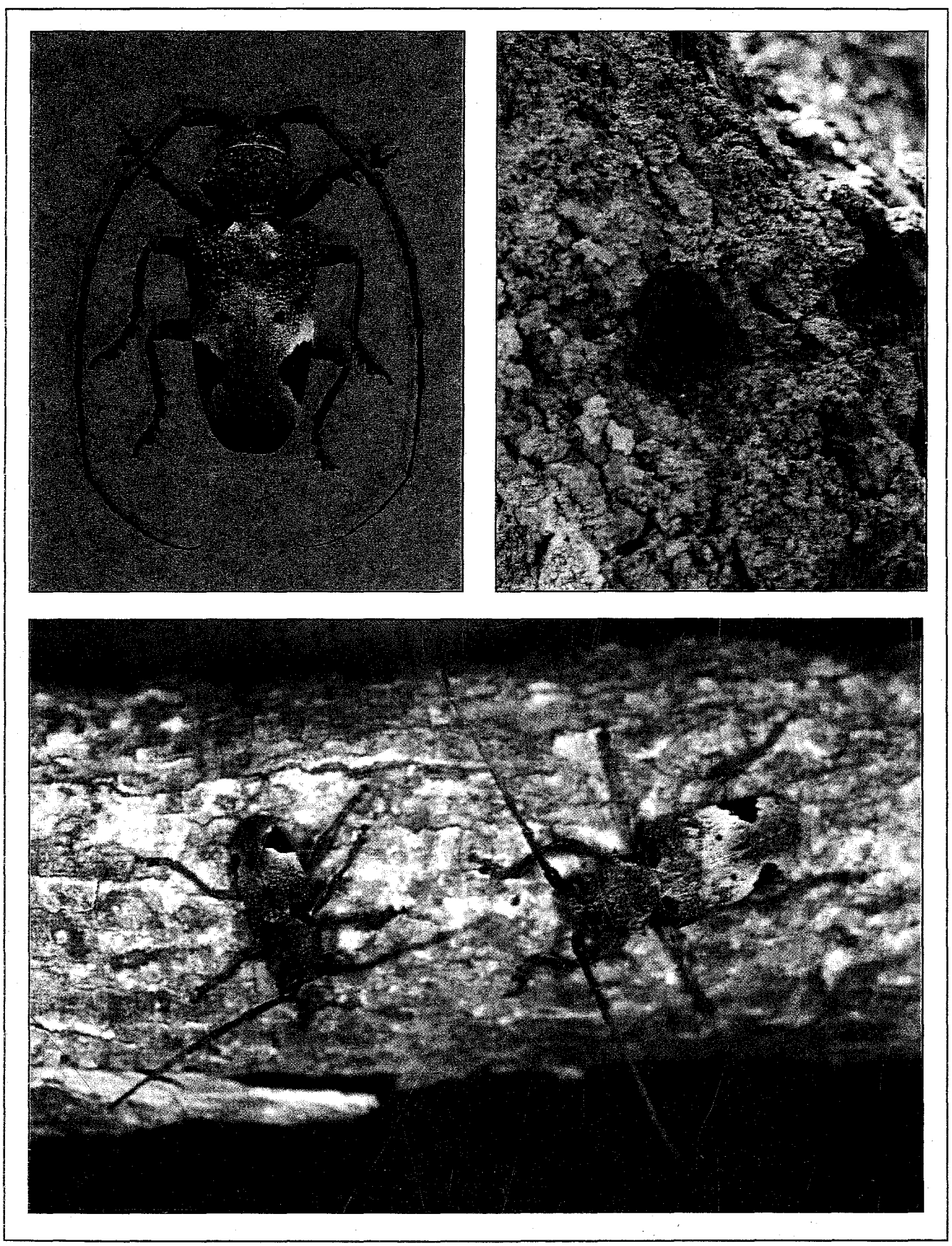

Plate 1: Top left; *phryneta leprosa.* (x 1.5) Top right: Damage to black mulberry (*Morus nigra*) by larvae of *P. leprosa.* Bottom: Two specimens on black mulberry branch>

trees. It is a known pest of *Castilloa*, of which entire plantations have often been destroyed; in Cameroon, this tree is now no longer planted (Aulmann, 1913). In Uganda, severe attacks were reported on *Morus* (Hargreaves, 1924). *P. leprosa* (Fabricius) is regarded as a major pest of *Chlorophora* in West Africa, where extensive damage owing to the relatively large galleries which extend deep into the heartwood of these trees was recorded (Duffy, 1957). The adult beetle is known to cause appreciable damage by gnawing the bark of young trees.

Larval development of *P. leprosa* (Fabricius) is reported to occur on a number of different unrelated plant species namely *Chlorophora excelsa*, *Funtimia elastica*, *Hevea*, *Manihot*, *Castilloa elastica*, probably *Ficus elastica*, *Antiaris africana*, *Antiaris toxicaria*, *Celtis africana*, *C. zenkeri*, *C. durandii*, *Bosqueia phoberos*, *Holoptelea grandis*, *Chaetacme aristata* and *Morus* spp. (Duffy, 1957), *Canarium schweinfurthii*, *Cynometra alexandrei*, *Entandrophragma angolense*, *Staudtia stipidata*, *Morus mesozygia*, *Beilschmiedia corbisieri*, *Celtis brieyi*, *Celtis mildebrandii*, *Mammea africana*, *Millettia drastica*, *Morinda lucida*, *Ompgalocarpum*, *Oxystigma oxyphyllum*, *Parinari holstii*, *Pleiocarpa micrantha*, *P. tubicina*, *Pterocarpus soyauxii*, *Ricinodendron africanum*, *Scorodophloeus zenkeri*, *Strombosiopsis tetranda*, *Synsepalum subcordatum*, *Tetrapleura tetraptera*, *Alstonia* spp. and *Afzelia africana* (Duffy, 1980).

RESULTS

In 1998, one of the authors (DD) was given two specimens of a longhorn beetle collected from near an old tree of *Morus nigra* (black mulberry, Maltese *tut*) in the Wied ta' l-Isqof area, between Rabat and Zebbug, Malta. These specimens were subsequently identified by the other author (DM) as *Phryneta leprosa* (Fabricius). Subsequent visits to the area revealed the presence of localised populations which had heavily infested and killed relatively old black mulberry trees.

Material examined -
Malta: Tal-Virtu (limits of Rabat), 16.ii.2000, 1 ex., leg. K. Bugeja; Mosta, 10.xi.2000, 1 ex., leg. A. Catania; Wied ta' l-Isqof, 30.xi.2000, 2 exs., leg. DD; Wied ta' l-Isqof, 23. iii.2002, 1 ex. (found dead), leg. DM & DD; Wied ta' l-Isqof, 26.vi.2002, 1 ex., leg. D. Mifsud; Wied ta' l-Isqof, 16.vii.2002, 4 exs., 2.viii.2002, 2 exs., 25.vi.2002, 6 exs., leg. P. Sammut; Wied ta' l-Isqof, 26.vi.2002, 2 exs., 28. vi.2002, 19 exs., 25 exs., leg. A. Seguna; Wied ta' l-Isqof 16.vii.2002, 5 exs., leg. A. Catania; Wied ta' l-Isqof 12 exs., leg. K. Bugeja; Hemsija (limits of Rabat), 12.vi.2002, 1 ex., leg. P. Scerri; Hemsija, 20.vi.2002, 1 ex., 26.vi.2002, 4 exs., leg. DM; Hemsija 26.vi.2002, 5 exs., leg. P. Sammut; Mdina, 29.ix.2002, 1 ex., leg. A. Catania; Ghammieri (Marsa), 27.x.2002, 1 ex., leg. J. Mifsud; Zebbug, 13.xi.2002, 1 ex., leg. A. Catania.

Damage and control - In the Maltese Islands extensive damage (due to larval mining) was observed on old *Morus nigra* trees. Locally, *M. nigra* is often cultivated for its fruit, and it is also planted as a roadside tree for ornamental purposes. In exceptional instances, more than 60 exit holes were found on a single tree of *Morus nigra*, inevitably leading to death of the tree. Adults were also observed actively gnawing the bark of young black mulberry shoots. On only one occasion was larval damage observed on a relatively young tree of the closely related white mulberry *Morus alba* (Malt. *cawsli*). Similar damage was also observed on nearby fig-trees, *Ficus carica* (Malt. *tin*).

The control of this pest is rendered difficult by the fact that the larvae mine deep into the heartwood of the trunks and main branches. Larvae may be killed by making an incision with a knife at one of the ejection holes (through which the larval frass is expelled) and then pushing a strong flexible wire along the gallery. However, in cases of heavily infested trees, the best control strategy would be to uproot and burn the trees. Another effective control method involves the detection and removal of the adult beetle at night. Although adults are not attracted to light, they are usually active during the night on the host plant. Insecticides are of little value, and can only be somewhat effective against the adult beetle if applied during the night. In Malta this should be done during the months of June, July and August, when it was observed that the adults are emerging and mating on the host trees.

Notes - Most likely, *P. leprosa* (Fabricius) was accidentally introduced in the Maltese Islands with large tree logs imported from Cameroon and intended for use in the timber industry. This is the fifth confirmed record of an exotic longhorn beetle which was accidentally introduced and established itself in the Maltese Islands, two of the other four species being *Cerambyx nodulosus* Germar, and *C. carinatus* Küster, both eastern elements which are now established pests of stone fruit trees (Sama, 1988; Mifsud& Booth, 1997; Mifsud, 2002). The other two species are *Phoracantha semipunctata* (Fabricius) which was first recorded in the Maltese Islands in the 1990s and *P. recurva* Newman, first recorded in 2001 (Mifsud & Booth, 1997; Mifsud, 2002). The two *Phoracantha* species are associated wioth *Eucalyptus* plantations.

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A SURVEY OF FUNGAL DISEASES ASSOCIATED WITH *VITIS VINIFERA* L. IN THE MALTESE ISLANDS

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ABSTRACT

A survey was carried out between July and September 2000 in 10 vineyards, (8 in Malta and 2 in Gozo) to investigate which fungal diseases were present. Samples, which included leaves, berries and stems infected by the fungi, came from both traditional and modern vineyard cultivation. Pathogenic fungi identified included 26 different fungi belonging to 21 genera; 21 taxa were reported on *Vitis vinifera* L. for the first time in the Maltese Islands. It was observed that the intensity of diseases was much more pronounced in the traditional rather than in the modern method of vine-training.

INTRODUCTION

A survey was carried out between July and September 2000 in 10 vineyards, 8 in Malta and 2 in Gozo to investigate fungal diseases of vines. Table 1 shows the location of the fields sampled.

METHODS

Samples (i.e. leaves, berries or stems) were taken from vineyards where traditional practices were followed as well as vineyards using modern practices. Field samples infected by fungi were quickly transferred to the Plant Health Laboratory at Marsa and stored in a cooler so as to preserve them.

In the laboratory, the samples, together with instruments and working bench, were first sterilised with appropriate disinfecting solutions (Brookes, 2001). Infected plant organs were carefully examined under a stereomicroscope for the presence of any fruiting bodies and fungal hyphae and then sectioned and cultured in agar to allow the fungus to develop. Culture media such as water agar, potato dextrose agar and Czapek dox were used according to whether the need was for a general or specialised medium. The prepared media were sterilised in an autoclave. They were then left to cool to a temperature of 45 °C. The prepared agar suspension was cautiously poured in petri

Table 1. Sampling data

Sample Number	Sampling Locality	Sampling Date	Type of Cultivation
1	Marsaxlokk, Malta	17.07.2000	Modern
2	Wardija, Malta	20.07.2000	Modern
3	Bingemma, Malta	24.07.2000	Traditional
4	Buskett, Malta	25.07.2000	Traditional
5	Fomm ir-Rih, Malta	30.07.2000	Traditional
6	Ta` Qali, Malta	01.08.2000	Modern
7	Tas-Silg, Delimara, Malta	20.08.2000	Traditional
8	Tas-Salib, Rabat, Malta	20.08.2000	Traditional
9	San Lawrenz, Gozo	01.09.2000	Traditional
10	Xaghra, Gozo	01.09.2000	Traditional

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dishes in equal proportions to a thickness of 5 mm. They were left to solidify in a laminar flow cupboard and annotated appropriately. Infected plant tissues were then placed on the agar and after some days the fungi were examined under both a stereomicroscope and a high power compound microscope. Fungal characteristics were noted and appropriate keys used for identification (see fungal key references).

RESULTS

The study produced 26 different taxa in 21 genera. The 21 fungi marked with an asterisk were recorded on *Vitis vinifera* L. for the first time in the Maltese Islands. The percentage composition of genera found was as follows: Obligate parasites: 10% (2); Facultative parasites: 29% (6) and Saprophytes: 61% (13) (Tabone, 2001). The following is a list of the fungi recorded:

FUNGI IMPERFECTI

FORM ORDER: MELANCONIALES

Gloeosporium sp. [Two species of *Gloeosporium* were recorded from vine by Borg (Borg, 1922)]

FORM ORDER: MONILIALES

Family: Dematiaceae

Acremonium sp. *
Alternaria alternata (Fr.) Keissler, *
Alternaria tenuissima (Kunze ex Pers.) Wiltshire, *
Aspergillus candidus Link.*
Aspergillus flavipes (Bainier & Sartory)*
Aspergillus nidulans (Reinhard Fischer)*
Aspergillus niger van Tiegh., *
Aspergillus versicolor (Vuillemin) Tiraboschi*
Cladosporium sp. [Two species of *Cladosporium* were recorded from vine by Borg (Borg, 1922)]
Helminthosporium sp. . *
Memnoniella sp. *
Pseudobotrytis sp. *
Stachobotrytis sp. *
Stemphylium sp. *
Ulocladium sp. *

Family: Moniliaceae

Botrytis cineria Micheli ex Pers. (1794)
Geotrichum sp. *
Monilia sp. *

FUNGI PERFECTI

ORDER: DOTHIDEALES

Family: Didymosphaeriaceae

Didymosphaeria igniaria Booth, *

ORDER: Erysiphales

Family: Erysiphaceae

Uncinula necator (Schwein.) Burrill 1851

ORDER: Microascales

Family: Microascaceae

Petriella sp. *

ORDER: Sordariales

Family: Chaetomiaceae

Chaetomium sp. *

Family: Ceratostomaceae

Persiciospora sp. *

Order: Peronosporales

Family: Peronosporaceae

Plasmopara viticola J. Schrot. (1886)

Order: Mucorales

Family: Mucoraceae

Mucor sp. *

Plasmopara viticola and *Oidium* spp. [oidial state of *Uncinula necator* (Schwein.) Burrill] were previously recorded on *Vitis vinifera* L. by Wheeler, B.E.J., (1957). The genus *Botrytis* was previously recorded by Borg (1922), Sommier & Caruana Gatto (1915) and Brooks, F. E. (2001). The two genera *Cladosporium* and *Gloeosporium* are mentioned by Borg (Borg, 1922) and are also mentioned in the fungal section of the Red Data Book (Lanfranco, 1989), which was based on Sommier & Caruana Gatto (1915).

Note: The Saccardo System was chosen for the classification of Imperfect Fungi. The primary basis of this system is the morphology of the sporulating structures as well as the morphology and pigmentation of conidia and conidiophores. However for the two largest families i.e. Moniliaceae and Dematiaceae, the Hughes-Tubaki-Barron System of classification was used. As for Ascomycetes and Oomycetes, the nomenclature follows Hawksworth, D.L. *et al*, 1995.

DISCUSSION

The most common obligate fungi were Powdery mildew, *Uncinula necator* (Schwein.) Burrill (1851), (6.5%), Downy mildew, *Plasmopara viticola* J. Schrot. (1886),

(12%) and grey mould, *Botrytis cineria* Micheli ex Pers. (1794) (23%) (Tabone, 2001). An explanation for the high occurrence of the latter could be due to the ability of this fungus to live as both parasite and saprophyte according to prevalent environmental conditions (Vella, 1991). It was sampled mainly from the berries, although leaves and stems were also affected. In the berries various saprophytic fungi were present together with *B. cinerea,* including several facultatively parasitic fungi.

Some of the more important facultatively parasitic fungi that were found in this study included *Alternaria, Cladosporium*, and *Stemphylium*. *Alternaria* was very common in many of the samples. and this could be due to its dual feeding behaviour i.e. as a primary and secondary invader (Goheen, & Person, 1994). *Cladosporium,* like *Alternaria,* is also a parasite but can also be a saprophyte. Only a few specimens of *Cladosporium* were present in the samples, possibly meaning that either the optimum conditions for this fungus were absent or that it had severe competition from other fungi such as *Alternaria* (Tabone, 2001). An important facultative parasitic fungus was *Stemphylium* which was found in 47% of all samples. It was noticed in the petri dish cultures that the populations of *Alternaria* and *Stemphylium* were inversely proportional possibly due to competition between the two fungi (Tabone, 2001). There seems to be an association between *Alternaria* and other species and *Stemphylium*, according also to Smith *et al* (1988).

Saprophytes included *Aspergillus*, *Acremonium* and *Stachobotrytis* amongst others. A relatively common disease was Grey Rot caused by the parasitic fungus *Botrytis cinerea.* Rot caused by *Helminthosporium* spp. alone is very similar to that caused by *Cladosporium herbarum.* These fungi, *Botrytis* and *Helminthosporium*, grow under humid conditions and sporulate on cast-off flower parts that remain in the cluster (Flaherty, 1992).

The traditional local grapevine varieties like *Girghentina* and *Gellewza* were found in the fields of small-scale or part-time growers whereas foreign varieties were found in the vineyards of commercial growers. It has been observed that the intensity of diseases was much more pronounced in the traditional rather than in the modern way of training the vines. The reason is probably that in the traditional bush form wind currents are much reduced and the penetration of solar radiation to the inner leaves and berries is also reduced, thus increasing humidity which promotes the growth of fungi. Conversely in the modern, more open system, the vines have good air circulation which reduces the relative humidity in the vines. Another reason could be that when using the traditional method, weed removal is difficult with the result that any diseased weeds present could infect the vines. Moreover an open canopy not only maintains a microclimate less favourable for disease development but also allows for better penetration of fungicides used to prevent or control the diseases (Tabone, 2001).

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