

LOUIS F. CASSAR

A REVISION OF THE BUTTERFLY FAUNA (*Lepidoptera Rhopalocera*)
OF THE MALTESE ISLANDS

SUMMARY

This paper presents a revised update of the butterfly fauna of the Maltese Islands. The research draws upon previously published lists and related species-specific works, as well as upon the results of recent DNA analysis of a number of selected species. Published records of butterfly species reported from the Maltese Islands between 1858 and 2017 are examined. A total of 64 listed species are presented in two separate groupings - species whose presence in the Maltese Islands is deemed to have occurred by natural means, and others whose occurrence is questionable.

RIASSUNTO

Revisione della fauna lepidotterologica (Lepidoptera Rhopalocera) delle Isole Maltesi. Questo articolo presenta un aggiornamento della fauna dei lepidotteri diurni delle Isole Maltesi. La ricerca si basa su liste ed articoli su singole specie pubblicati in precedenza; inoltre prende in considerazione i risultati di recenti analisi del DNA di alcune specie. Sono stati esaminati tutti i dati di specie di lepidotteri diurni riportati per le Isole Maltesi tra il 1858 ed il 2017. In totale sono elencate 64 specie in due separati gruppi - specie la cui presenza nelle Isole Maltesi si considera avvenuta con mezzi naturali, e specie la cui presenza nelle Isole Maltesi è discutibile.

BACKGROUND

The butterfly fauna of the Maltese Islands has long attracted attention. Accounts of butterfly sightings and lists were published from time to time as from the early 19th century, largely by foreign visitors to the Islands (SAMMUT,

2000). During the latter part of the century, publications by Maltese workers incorporating species lists began to emerge (GULIA, 1858; CARUANA-GATTO, 1891a, 1891b), while during the initial part of the 20th century, various authors, both local and foreign, contributed further to the knowledge of local butterfly fauna¹ (BAINBRIGGE-FLETCHER, 1904-05; CARUANA-GATTO, 1905, 1925; ANDRES, 1916; P. BORG, 1932; J. BORG, 1939). It was during the latter part of the 20th century and later that a degree of accuracy was established with respect to the status of local butterfly species, with key works published, i.e., those of VALLETTA (1966, 1972, 1974), SCHEMBRI (1977), and SAMMUT (1982, 1984, 2000). Various other species-specific records exist, many of which, with the exception of a few possibly spurious claims, represent valid contributions to the entomo-fauna of the Maltese Islands.

This work follows the Systematic order as listed in TSHIKOLOVETS (2011) and, in addition to new records and taxonomic updates, it is based, in part but not exclusively, upon three local contributions, namely: VALLETTA (1972), SCHEMBRI (1977) and SAMMUT (2000). It also incorporates recent findings of DNA analysis carried out by colleagues at the Institut de Biologia Evolutiva in Barcelona and the University of Malta. Moreover, relatively recent phylogenetic analysis (HEIKKILÄ *et al.*, 2011) proposes that the Papilionoidea are a paraphyletic group and, on the basis of cladistic relationships, the Hesperidae have been placed in this superfamily; this work follows this arrangement.

The present contribution divides local records into two lists. The first, which entails the main section, comprises 30 species that are resident and/or regular migrants, including those species that have become naturalized, together with species that are rare and/or vagrant². The second list catalogues 34 species, records of which are considered erroneous³ or dubious⁴, together with sightings that are considered to be the result of accidental human importation. This latter list, which represents species whose natural occurrence in the wild state is questionable, is compiled in Appendix 1.

This contribution is dedicated to the following individuals who, throughout my years of involvement, have actively and genuinely strived to further the knowledge of Maltese butterfly fauna and/or promote its conservation: Guido Bonett, John J. Borg, Aldo Catania, Dr Martin J. Ebejer, Guido Lanfranco, Paul M. Sammut, Dr Stephen Schembri, Anthony Seguna and the late Anthony Valletta.

¹ Even though a fair percentage of the species listed are questionable (see Appendix).

² Accidental natural occurrence.

³ Considered a product of misidentification.

⁴ Likely due to some authors listing species inaccurately as a result of overenthusiasm, inexperience or, potentially, deliberate intent to deceive.

RESIDENT AND/OR REGULAR MIGRANT, NATURALIZED, RARE AND/OR
VAGRANT SPECIES

Superfamily **PAPILIONOIDEA**

Family **HESPERIIDAE**

Subfamily HESPERIINAE

Gegenes pumilio (Hoffmannsegg, 1804)

A relatively uncommon resident species, with a localized distribution. Typically occurs in comparatively sheltered but open areas, such as karstic and stony terrain with grass steppe within and around shallow valleys and cultivated farmland.

Family **PAPILIONIDAE**

Subfamily PAPILIONINAE

Papilio machaon Linnaeus, 1758

Quite a common resident species; however, notwithstanding the proliferation of one of its larval food-plants, *Foeniculum vulgare*, as a result of secondary succession caused by widespread habitat degradation, the species does not seem to have experienced an appreciable increase.

Family **PIERIDAE**

Subfamily PIERINAE

Pieris rapae (Linnaeus, 1758)

One of the commoner breeding species in the Maltese Islands and one whose numbers are regularly supplemented by migratory influxes.

Pieris brassicae (Linnaeus, 1758)

A relatively common breeding species, numbers of which are augmented by influxes during multi-generational migration occurring across the central Mediterranean.

Euchloe belemia (Esper, 1800)

A vagrant species known only through two specimens taken in 1970 during a

noted butterfly migration in springtime of the same year (VALLETTA, 1972); at the time, the direction of passage was characteristically northward. It is plausible to assume that these butterflies, whose range includes northern Africa, joined other species on migration across the Mediterranean.

Pontia edusa (Fabricius, 1777)

A regular and common migrant, which is also known to breed locally. During particularly heavy autumn passages, significantly large numbers make landfall. Until quite recently, the species that occurs locally was presumed to be *Pontia daplidice*. Molecular studies by colleagues in Spain and at the University of Malta since appear to have settled the matter, i.e. the species occurring locally appears to be *Pontia edusa*. In view of Malta's geographical position on the Siculo-Tunisian sill, however, it is not wholly excluded that both species may, on occasion, occur on the Islands during migration. Further investigations are thus projected.

Subfamily COLIADINAE

Colias croceus (Fourcroy, 1785)

Quite a common breeding migrant species. However, it has been noticed that numbers tend to decline sharply when the species is not migrating across the region; as a result, it tends to become far less frequent locally.

Gonepteryx cleopatra (Linnaeus, 1767)

A relatively common resident species, which however, is largely localized in wooded and other sheltered areas, such as gorge-type valley systems where its food-plants (*Rhamnus alaternus* and *R. lycioides* ssp. *oleoides*) occur.

Family LYCAENIDAE

Subfamily THECLINAE

Callophrys rubi (Linnaeus, 1758)

Known from a singular record, for which only the locality is known (BORG, 1939, as reported in SAMMUT, 2000). In view of the author's propensity for misidentifying butterflies but also considering that this particular species cannot easily be confused with many others, it would be reasonable to list it as a vagrant, which may have reached the Island either as an adult via a sea crossing or through accidental importation, in larval or pupal form, with consignments of trees or shrubs.

Subfamily LYCAENINAE

Lycaena phlaeas (Linnaeus, 1761)

A formerly common resident species, which nowadays is extremely rare. With no verified sightings for a good number of years, it was considered to have been extirpated; however, field sightings by reliable naturalists in 2017 reconfirmed its presence in Malta. The local population seems to have experienced a sharp decline, reasons for which are probably associated with habitat degradation. This could stem from dumping, excessive pesticide use and, potentially, perturbations resulting from prolonged arid spells and severe climatic episodes that lead to a mismatch ('out-of-sync' phenomenon) between life-cycle stages and the availability of resources for foraging and egg deposition by the adult, and suitable food-plants for the larvae. Whether the species' recovery was a case of a few remnant individuals restoring a foothold after a population crash, a recolonization event by a migrant influx, or a combination of both, remains to be seen. Whatever the reason, urgent conservation measures need to be undertaken for this and numerous other species.

Subfamily POLYOMMATINAE

Lampides boeticus (Linnaeus, 1767)

Listed as uncommon by SAMMUT (2000); however, *Lampides boeticus* may be more frequent in localities where its larval food-plants occur and where foraging opportunities for the adult butterfly exist; these may include areas colonized by grass steppe, cultivated farmland and gardens, as well as semi-arid landscapes surrounding seasonal river valleys.

Leptotes piritheus (Linnaeus, 1767)

Quite a common species, particularly in those areas where *Plumbago auriculata* (one of its favoured larval food-plants) is cultivated. *Leptotes piritheus* was first recorded in Malta in 1910 via a single specimen taken at St Julian's Bay; however, it was not until 1944 that Anthony Valletta discovered a small population at San Anton Gardens (VALLETTA, 1972), which has since spread and established itself across the Maltese Islands.

Cacyreus marshalli Butler, 1898

This species, a native to southern Africa, is a relatively recent addition to the list of local Rhopalocera. Presumably, accidental importation via the horticultural industry is responsible for its presence across Europe, in the Mediterranean and on some Macaronesian islands. Due to widespread cultivation of *Pelargoniums*, it has become naturalized in a very short time. It was first recorded in Malta in 2007 (FENECH, 2007) and has since spread across the Islands.

Azanus ubaldus (Stoll, 1782)

A recent addition to the lepidoptero-fauna of the Maltese islands, which appears to have established a foothold on the main Island; the discovery of its larval form in the wild state further attests to this assertion (CATANIA & SEGUNA, 2017). This species was first recorded in July of 2016 by Charles Gauci in the limits of Mosta and, within a very short span of time, was sighted in numerous localities across the main Island. The species is confirmed to have sustained its presence to date (Aldo Catania, *pers. comm.*, March 2018).

Zizeeria karsandra (Moore, 1865)

This species (initially identified as *Zizeeria knysna*), which was first recorded locally in 1966, has slowly established itself in a handful of localities. It was initially regarded as very rare locally having been taken the second time over a decade after the initial record (SAMMUT, 2000), but it appears that the species has managed to sustain small, localized populations; nonetheless, the species can be considered relatively quite rare and thinly spread. Thus, from the conservation point of view, it is a vulnerable species at the local level. DNA analysis carried out by colleagues in Spain (Institut de Biologia Evolutiva, Barcelona) and later at the University of Malta, confirmed that the species is *Zizeeria karsandra*.

Celastrina argiolus (Linnaeus, 1758)

This species was first discovered in Malta in March of 1961 at Buskett, following which it dispersed across many parts of the main Island (VALLETTA, 1972). Until recently, *Celastrina argiolus* was considered a relatively common species, but has since sustained a population decline. In view of the fact that its larval food-plants characteristically colonize woodland and valley biotopes, its primary habitat remains physically fragmented. Moreover, the use of aerosol pesticides on surrounding cultivated land parcels continues to further impinge upon its habitat along its fringes via the phenomenon of edge-effect.

Plebejus argus (Linnaeus, 1758)

Known from a single, confirmed record of a male specimen that was taken in August of 1975 on Manoel Island (CILIA, 1979).

Aricia agestis (Denis & Schiffermüller, 1775)

A formerly common species (VALLETTA, 1972), which has become exceedingly rare in recent years, possibly even extirpated.

Polyommatus thersites (Cantener, 1835)

A very rare species to-date, known solely from two reliable records (VALLETTA, 1985; SAMMUT, 2000). This species closely resembles *Polyommatus celina* and it may

well transpire that it is more frequent locally than presently recognized. Further field research is therefore essential.

Polyommatus celina (Austaut, 1879)

A relatively common species, which, for many years, was thought to be *Polyommatus icarus*. DNA analysis has since confirmed that the species in question is *Polyommatus celina*.

Family NYMPHALIDAE

Subfamily DANAINAE

Danaus chrysippus (Linnaeus, 1758)

A relatively regular autumn migrant, confirmed to have bred in the wild. Larvae have been noted in a number of public gardens on various occasions, particularly during 'heavy' passage of migrant butterflies, feeding on cultivated *Gomphocarpus fruticosus* (CATANIA, 1999). To-date, however, there is no evidence of established local populations.

Subfamily SATYRINAE

Pararge aegeria (Linnaeus, 1758)

This species, which was formerly quite common within woodland and sheltered valleys, has become very rare in recent years, as its local range declined appreciably. Far fewer sightings are being noted and extirpation of this species is not being ruled out.

Lasiommata megera (Linnaeus, 1767)

Until recent years, *Lasiommata megera* was a very common species. However, in the last few years, it has become far less frequent.

Coenonympha pamphilus (Linnaeus, 1758)

This species was relatively quite common until some years ago; however, its numbers have declined markedly in recent times. It is now very uncommon and localized, and if present trends persist, it shall likely face extirpation. Both spring and summer⁵ brood forms are known from the Maltese Islands.

⁵ The buff-coloured and slightly larger summer form *lyllus* is deemed a separate species by some authors (Boillat, 2002; Dapporto *et al.*, 2012).

Maniola jurtina (Linnaeus, 1758)

A somewhat rare resident species that has experienced a sharp population decline in the last decade or so. The species still maintains small, fragmented populations in a couple of localities, but current trends do not bode well.

Hipparchia blachieri (Fruhstorfer, 1908)

A very rare taxon, known solely from three reliable records (VALLETTA, 1972; SAMMUT, 2000; Aldo Catania, *pers. comm.*, March 2018). It was initially recorded as *Hipparchia algerica* and subsequently deemed an endemic form and assigned subspecies status - *H. algerica vallettai* (DE LATTIN, 1952). Revisions of the species complex further proposed changes in taxonomic rank; SAMMUT (2000) recommended that, until resolution of the nomenclature issue, the locally recorded specimens be referred to as *Hipparchia aristeus blanchieri*, a subspecies that is also known from Sicily. Subsequent DNA analysis accorded 'algerica' to the north African taxon, incorporating within its range, Morocco, northern Algeria, and NW Tunisia (TSHIKOLOVETS, 2011). TSHIKOLOVETS (2011) moots the possibility that the taxon *vallettai* De Lattin, 1952 belongs to *H. blachieri* (which, in turn, appears to have been ranked by some as a subspecies of *Hipparchia* (*Parahipparchia*) *neapolitana* (Stauder, 1921) – see Fauna Europaea), but proposes further research. Based on Malta's geographical proximity to Sicily as well as on recent DNA analysis, it is proposed that the Malta taxon is treated as *Hipparchia blachieri* (Fruhstorfer, 1908), until new evidence suggests otherwise.

Subfamily NYMPHALINAE

Vanessa atalanta (Linnaeus, 1758)

Common breeding migrant, whose numbers increase dramatically during episodes of multi-generational passage across the region.

Vanessa cardui (Linnaeus, 1758)

One of the world's most widely distributed species, practically cosmopolitan, with some exceptions. During episodes of spring and autumn multi-generational passage, *Vanessa cardui* has been known to appear in extraordinary large numbers, as many thousands of butterflies undertake sea crossings across the central Mediterranean. It is not uncommon, during these occurrences, to encounter exceptionally large concentrations of larvae on its food-plants.

Polygonia egea (Cramer, 1775)

An extremely rare species, known to have occurred locally on merely two occasions (VALLETTA, 1948, 1979; SAMMUT, 2000). VALLETTA (1972), who reported both

records, says that although *Polygonia egea* is not a noted long-distance migrant, it was nevertheless recorded during a migration event of Clouded Yellow and Bath White. The species occurs in Sicily, which is the closest landmass to the Maltese Islands, at just over 80 km linear distance.

Nymphalis polychloros (Linnaeus, 1758)

Known from a single specimen taken on Comino in 1985 (SCHEMBRI, 1986), possibly during a migration episode. It is interesting that a species characteristically known to inhabit the forest-fringe and woodland clearings was recorded on a quasi-barren island typified by karstland with sparse low-lying vegetation and scant woodland cover. Might the specimen in question have been hilltopping (needless to say, pointlessly)? *Nymphalis polychloros* was also listed as rare by BORG (1932), although he fails to provide tangible data.

APPENDIX 1
ERRONEOUS OR DUBIOUS RECORDS
AND SPECIES OF ACCIDENTAL HUMAN IMPORTATION

Superfamily **PAPILIONOIDEA**

Family **PAPILIONIDAE**

Subfamily **PAPILIONINAE**

Papilio sabarae Oberthür, 1879

LERAUT (2016) lists this species for Malta on what appears to be scanty evidence based solely on photographs that he examined via the Internet and on the basis of which he makes the following statement: “Illustrations on the Internet of *melitensis* Eller from Malta convinced me that it is indeed *P. sabarae melitensis* Eller, 1936, **stat. rev.**” Alas, Leraut does not provide convincing evidence based, for example, on morphometric analysis or molecular characterization to substantiate his hypothesis.

Iphiclides podalirius (Linnaeus, 1758)

This species was listed by some 19th century workers as having occurred locally. However, apart from the prevalence of its food-plants across the Maltese Islands, particularly *Prunus dulcis* and *Crataegus monogyna*, there is no evidence that demonstrates that *Iphiclides podalirius* occurred locally; nor is the author aware of any records in the 20th century or later.

Family **PIERIDAE**

Subfamily DISMORPHIINAE

Leptidea sinapis (Linnaeus, 1758)

Listed as having occurred together with other Pierid butterflies during migration (BORG, 1932). Other workers have never recorded the species and, in addition, it appears most unlikely that such a seemingly frail butterfly as *Leptidea sinapis* can undertake an extensive sea crossing such as that which exists between Malta and Sicily (the nearest landmass). It is therefore assumed to have been a case of misidentification.

Subfamily PIERINAE

Aporia crataegi (Linnaeus, 1758)

A single specimen was reported to have formed part of the Royal University of Malta collections (CARUANA-GATTO, 1891). Moreover, it was suggested by BORG (1932) that this species was an occasional visitor to the Maltese Islands, presumably during migration events. Apart from these claims, no other scientific worker has reported this species. It is highly likely a case of misidentification.

Pieris napi (Linnaeus, 1758)

Listed by CARUANA-GATTO (1891), BORG (1932) and SALIBA (1963); BORG (1932) further claimed that this was locally a very common species. However, *Pieris napi* does not occur in the Maltese Islands, nor has it been reported by dependable field observers in the last five decades or so. It is highly likely a case of misidentification.

Euchloe ausonia (Hübner, [1804])

Reportedly taken by a certain Harrison (VALLETTA, 1974) while visiting Malta for three days. It is evident that this is either a case of misidentification or, quite likely, a matter of erroneous specimen labelling.

Euchloe crameri Butler, 1869

HIGGINS & RILEY (1978, as reported in SAMMUT, 2000) erroneously listed this species for Malta in the German version of Butterflies of Britain and Europe.

Anthocharis euphenoides Staudinger, 1869

BORG (1939) maintained that this species often reached Malta's shores with other Pieridae during migration. *Anthocharis euphenoides* has not been listed by any other scientific worker and this is clearly a case of misidentification.

Pontia daplidice (Linnaeus, 1758)

See *Pontia edusa*. Until very recently, it was presumed that *Pontia daplidice* occurred locally. However, DNA analysis carried out by colleagues in Spain (Institut de Biologia Evolutiva, Barcelona) and subsequently at the University of Malta, confirmed that the species had essentially been misidentified.

Belenois (Anaphaeis) aurota Fabricius, 1793

This Palaetropical migrant is said to have been taken in 1910 by Colonel Harford, a British lepidopterist, at the San Anton Palace gardens. This specimen may well have been accidentally imported in larval or pupal form with exotic plants that adorn the said Palace gardens, which at the time were used as official residence of the colonial Governor. Its natural range extends from the southern-most parts of Algeria, eastwards to the Red Sea and onto the Arabian Peninsula and the Indian subcontinent; its range also includes a significant expanse of dry-tropical Africa (LARSEN, 1990; TSHIKOLOVETS, 2011). Larsen further points out that migrants reach Israel, Lebanon and Jordan on an irregular basis, while records from Egypt “*are few and far between*” (LARSEN, 1990). Its singular occurrence in Malta is therefore attributed to accidental introduction by the human agency.

Subfamily COLIADINAE

Colias hyale (Linnaeus, 1758)

Known from three 19th century records; it is however assumed that the specimens in question were confused with the pale form *belice* or other similar pallid *Colias croceus* forms and aberrations; *Colias hyale* has not been known to occur locally.

Colias lesbia (Fabricius, 1775)

This South American *Colias* species was included in 19th century lists by two authors. Undoubtedly confused with *Colias croceus* and hence a case of mistaken taxonomic determination.

Catopsilia florella (Fabricius, 1775)

This species was reportedly taken in Malta by a certain Harrison (VALLETTA, 1974) during a brief three-day stop on the Island. This is evidently either a case of misidentification or, more probably, a case of erroneous specimen labelling.

Gonepteryx rhamni (Linnaeus, 1758)

Listed as a resident species in the 19th century and early 20th century by at least five authors (DE LA GARDE, 1892; SAMMUT, 2000). However, *Gonepteryx rhamni* does not occur locally and this is most likely a case of recurring mistaken reporting.

Family **LYCAENIDAE**

Subfamily POLYOMMATINAE

Tarucus theophrastus (Fabricius, 1793)

This species was reportedly taken in Malta by a certain Harrison (VALLETTA, 1974) during a brief three-day stop on the Island. This is evidently either a case of misidentification or, more probably, a case of erroneous specimen labelling.

Zizeeria knysna (Trimen, 1862)

See *Zizeeria karsandra*. DNA analysis carried out by colleagues in Spain (Institut de Biologia Evolutiva, Barcelona) and subsequently at the University of Malta has demonstrated that the species of *Zizeeria* occurring in Malta is not *Z. knysna*.

Glaucopsyche alexis Poda, 1761

The reporting of this species is clearly a case of misinformation. It was mentioned in the lecture notes of a course in elementary entomology (GULIA, 1858). However, this species was never recorded in Malta.

Pseudophilotes baton (Bergsträsser, 1779)

This species was reportedly taken in Malta by a certain Harrison (VALLETTA, 1974) during a brief three-day stop on the Island. This is evidently either a case of misidentification or, more probably, a case of erroneous specimen labelling.

Polyommatus icarus (Rottemburg, 1775)

See *Polyommatus celina*. Until recent years, *Polyommatus icarus* was presumed to occur locally. DNA analysis carried out by colleagues in Spain (Institut de Biologia Evolutiva, Barcelona) has, however, demonstrated otherwise; this was likely misidentification due to confusion with *P. celina*.

Polyommatus (Lysandra) bellargus (Rottemburg, 1775)

Listed by BORG (1932); however, it has not been recorded since, nor has it been reported by any other worker. This species is absent from landmasses nearest to the Maltese islands, including the southern tip of Italy, Sicily, and North Africa. It is thus being treated as a case of misidentification.

Family **NYMPHALIDAE**

Subfamily LIBYTHEINAE

Libythea celtis (Laicharting, 1782)

TOLMAN & LEWINGTON (1997) erroneously extended the range of this species and included the Maltese Islands; in reality, this species does not, to-date, occur locally.

Subfamily SATYRINAE

Lasiommata maera (Linnaeus, 1758)

This was most likely a case of mistaken identification. In passing, BAINBRIGGE-FLETCHER (1904-05) (SAMMUT, 2000) claimed that the species was only noted in flight by a third party in 1897, but was not taken and its identity was thus not confirmed. For this reason, BAINBRIGGE-FLETCHER (1904-05) decided not to include it in his list of 1898. This species has not been recorded by other workers.

Coenonympha tullia (Müller, 1764)

This is clearly a case of misidentification; a specimen was allegedly taken in 1954 by an individual visiting Malta (SAMMUT, 2000).

Pyronia bathseba (Fabricius, 1793)

CARUANA-GATTO (1891; as reported in SAMMUT, 2000) mentions the possibility that a specimen of *Pyronia bathseba* may have formed part of the Royal University of Malta collections. Due to poor curation practices, however, the collection in question (belonging to Fr Libassi) no longer existed, even at the time of Caruana-Gatto. As a consequence, Caruana-Gatto relied on a list provided by a third party, Dr Saverio Schembri, the then rector of the university (SAMMUT, 2000). This species does not occur locally, nor has it been recorded by other workers.

Pyronia tithonus (Linnaeus, 1771)

Listed by BORG (1932); however, it has not been recorded since, nor has it been reported by any other worker. Clearly a case of misidentification.

Subfamily NYMPHALINAE

Hypolimnas misippus (Linnaeus, 1764)

The species was sighted twice during the latter part of 2010 (SCIBERRAS & SAMMUT, 2012), 12 days apart and in two locations some four km (linear distance) from one another. It is not excluded that the sightings in question entailed the same individual. Given the species' known range in relation to the central Mediterranean, including the Azores, Madeira and two of the Canary Islands towards the west, and Turkey, Syria, Lebanon, Israel and the Nile Delta in the eastern Basin, apart from much further afield in Asia, Africa and America (TSHIKOLOVETS, 2011), it is obvious that this was a case of human importation. It may plausibly have been an instance of butterflies' release during some wedding or similar social festivity.

Polygonia c-album (Linnaeus, 1758)

Doubtful occurrence. This species was listed by BORG (1932), as well as mentioned by AQUILINA (1981) on the basis of a single specimen at the Natural History Museum, which, however, may not have been taken locally (SAMMUT, 2000).

Aglais io (Linnaeus, 1758)

Known from a total of four local records. It is exceedingly probable that the initial two records were due to human importation; the first one of 1975 (AQUILINA, 1980) was assumed to be one of two escaped specimens that lepidopterist Anthony Valletta had brought with him from the UK at the time. The second specimen, which was recorded in 1991, was discovered inside a vehicle that had been imported, at the time, from the United Kingdom. During the latter part of 2010, two further sightings were made, at Ghadira and Mizieb respectively (CACHIA & SCIBERRAS, 2010). These northern coastal sites lie within approximately 3.6 km (linear distance) from one another. It may be appropriate to note that thousands of trees were planted in the Ghadira area as part of an extensive afforestation project (FORESTA, 2000), many of which were imported from Italy, where *Aglais io* is relatively quite common, in suitable habitats from sea-level to >3000 m (TSHIKOLOVETS, 2011).

Although the species occurs in Sicily, it is not known to engage in multi-generational migration (TENNENT, 1996), typically associated with other Nymphalid species. *A. io* is adapted to live across a variable altitude gradient, which allows it the versatility to exploit suitable environments as temperatures fluctuate; in addition, a more compelling argument in favour of passive dispersal (via accidental importation) is the fact that the species is known to hibernate (overwintering as imago) and, as a result, would not ordinarily resort to sea-crossings as temperatures begin to drop with the onset of the cooler wet season. Consequently, *Aglais io* is not considered to have occurred in Malta via natural means of dispersal.

Aglais urticae (Linnaeus, 1758)

Although the species occurs in Sicily to the north of the Maltese Islands, *Aglais urticae* does not occur anywhere in the Maghreb. Therefore, the assumption that local occurrences were part of conventional migration episodes across the central Mediterranean can largely be ruled out, unless the specimens in question were merely part of unique dispersal event and thus arrived as accidental visitors. Furthermore, dispersal by any other means does not appear plausible, especially since *A. urticae* is known to overwinter in adult form and, like *Aglais io*, is adapted to a variable altitude gradient - in the case of *Aglais urticae*, up to 3000 m (TSHIKOLOVETS, 2011).

For a variety of reasons, a degree of controversy surrounds early 20th century claims (BAINBRIGGE-FLETCHER, 1904-05; P. BORG, 1932; J. BORG, 1939), given that contemporary workers never recorded the species and, not least, due to the lack of veracity associated with some of these claims as well as at least one author's propensity for misidentifying species. More recently, a specimen allegedly taken in 1985 came to light in 2002, while a year later there was yet another claim of a specimen having been set and assumed to be *Vanessa cardui*, later discovered to be *Aglais urticae*! In 2011, the remains of a third specimen were reportedly found in a commercial fly-trap (SCIBERRAS, 2012). It may be useful to sequence recent specimens with a view to investigate whether these belong to *A. urticae* f. *turcica* or to *A. urticae urticae*.

Consequently, because of the somewhat nebulous circumstances described,

which do not afford a basis for reasonable inference of these occurrences, *Aglais urticae* is not, for the purposes of this revision, being considered as having occurred locally via natural means of dispersal until tangible evidence is afforded.

Nymphalis antiopa (Linnaeus, 1758)

Accidental occurrence. Known from a single record, a female, taken in June of 2013 from Birzebugia (SEGUNA, 2013). The specimen was found at Il-Brolli, a locality within Birzebugia, in somewhat close proximity to the Freeport transshipment container terminal. SEGUNA (2013) suggests ‘accidental human importation’, potentially in pupal stage, as the mechanism of dispersal for this particular specimen.

Subfamily ARGYNNINAE

Argynnis adippe (Denis & Schiffermüller, 1775)

This species was mistakenly reported in a late 19th century list (SAMMUT, 2000). *Argynnis adippe* has not been recorded by any reliable field worker in the last seventy years or so.

Boloria (Clossiana) dia (Linnaeus, 1767)

Listed by BORG (1932). It has not been recorded since, nor has it been listed by any other scientific worker. Moreover, this species does not occur anywhere in the geographical vicinity of the Maltese Islands. Clearly a case of misidentification.

Subfamily MELITAEINAE

Melitaea didyma (Esper, 1778)

An improbable record based on a single ‘sighting’ of a specimen observed in flight in 1910, which, however, was not caught for accurate verification (CARUANA-GATTO, 1925). *Melitaea didyma* does not occur locally, nor has it been recorded by other workers.

Melitaea cinxia (Linnaeus, 1758)

Listed as uncommon by BORG (1932). It has not been recorded since, nor has it been listed by any other scientific worker. Moreover, the species does not occur on the Hyblean plateau within SE Sicily nor anywhere in Tunisia (TSHIKOLOVETS, 2011). Clearly a case of misidentification.

Acknowledgements — Grateful thanks are due to Dr Elisabeth Conrad of the Institute of Earth Systems, University of Malta, for meticulously proofreading the manuscript and for suggesting improvements to the text. The author would also like to extend his appreciation towards Mr Guido Bonett, Mr Aldo Catania, and Mr Paul M. Sammut, who have shared valuable insights and

dependable information on various species of Rhopalocera of the Maltese Islands, as well as to Alex Casha and Ray Vella for sharing their views on some recent, specific records. Sincere thanks are due to Ms Ruth Galdies and Dr Charles Galdies for leading the on-going DNA analysis at the University of Malta. A special word of thanks is also due to Dr Raluca Voda, Dr Roger Vila, Dr Leonardo Dapporto and the technicians at Institut de Biologia Evolutiva in Barcelona, for sharing their findings so generously.

BIBLIOGRAPHY

- ANDRES A., 1916. Verzeichnis der während meiner Kriegsgefangenschaft von mir auf Malta gesammelten Lepidoptera, Hemiptera und Coleoptera. *Ent. Rundschau*, 33 (9): 43-45, (10): 48-49, (11): 50.
- AQUILINA C., 1980. On the appearance of a specimen of *Inachis io* L. in Malta. *Potamon*, 5: 56.
- AQUILINA C., 1981. On an alleged specimen of *Polygonia c-album* captured in Malta. *Bull. Amateur Ent. Soc.* 40 (333): 173.
- BAINBRIGGE-FLETCHER T., 1904-05. A Preliminary List of the Lepidoptera of Malta. *Entomologist*, 37: 273-276, 315-319; 38: 18-20.
- BOILLAT H., 2002. *Coenonympha lyllus* Esper, 1805, spec. rev. Une nouvelle approche taxinomique du complexe *pamphilus*. *Alexanor*, 22: 243-309.
- BORG J., 1939. Our Insect Visitors. *Archivum Melitense*, 9 (4): 196.
- BORG P., 1932. The Lepidoptera of the Maltese Islands. *Government Printing Press*, Valletta, v+25 pp.
- CACHIA D. & SCIBERRAS A., 2010. *Aglaïs io* (Linnaeus, 1758) in the Maltese Islands (Lepidoptera: Nymphalidae). *Central Medit. Nat.*, 5 (2): 63-66.
- CARUANA-GATTO A., 1891a. Prima Contribuzione alla Fauna Lepidotterologica dell'Isola di Malta. *Riv. piemontese Sc. nat.*, 11 (5): 1-8.
- CARUANA-GATTO A., 1891b. Notes on the Lepidoptera of Malta. *Medit. Nat.*, 1 (6): 85-88, 106-107.
- CARUANA-GATTO A., 1905. Seconda Contribuzione alla Fauna Lepidotterologica dell'Isola di Malta - Eteroceri. *Tipografia del 'Malta'*, Valletta, 32 pp.
- CARUANA-GATTO A., 1925. Di Alcune specie di Farfalle Erratiche Catturate o Osservate in Malta. *Archivum Melitense*, 6 (4): 155-159.
- CATANIA A., 1999. The plain tiger, *Danaus chrysippus* - the 21st butterfly breeding in Malta. *Bull. Amateur Ent. Soc.*, 58 (423): 76-77.
- CATANIA A. & SEGUNA A., 2017. On the Occurrence of the *Azanus ubaldus* (Stoll, 1782) in the Maltese Islands (Lepidoptera: Lycaenidae). *SHILAP Revta. lepid.*, 45 (178): 213-216.
- CILIA J.L., 1979. *Plebejus argus* L., in Malta. *Proc. Br. Ent. & Nat. Hist. Soc.*, 12 (3-4): 76.
- DE LA GARDE P., 1892. Mediterranean Lepidoptera. *Medit. Nat.*, 1 (9): 133-135; 1 (10): 147-148.
- DE LATTIN G., 1952. Two new subspecies of *Hipparchia semele* L. *Ent. Record*, 64: 335-336.
- DAPPORTO L., BRUSCHINI C., DINCA V., VILA R. & DENNIS R.L., 2012. Identifying zones of phenetic compression in West Mediterranean butterflies (Satyrinae): refugia, invasion and hybridization. *Div. & Distrib.*, 11: 1066-1076.
- FENECH N., 2007. New species of butterfly recorded in Malta. *Times of Malta* (June, 30).
- GULIA G., 1858. Corso elementare di Entomologia Maltese dato nel Palazzo di Sant' Antonio. Lezione quarta, Classe sesta, pp. 46-56.
- HIGGINS L.G. & RILEY N.D., 1978. Die Tagfalter Europas und Nordwestafrikas. *Verlag Paul Parey*, Hamburg und Berlin, 377 pp+60 pl.
- HIGGINS L.G. & RILEY N.D., 1980. A field Guide to the Butterflies of Britain and Europe. *Collins*, London. 384 pp.+63 pl.

- LARSEN, T.B. (1990): The Butterflies of Egypt. Apollo Books, American University Press, Cairo. 112 pp.+8 pl.
- LERAUT P., 2016. Butterflies of Europe and neighbouring regions. *N.A.P Editions*, Verrières-le-Buisson, 1113 pp.+ 655 pl.+ 6000 ph.
- SALIBA L., 1963. Insect Pests of Crop Plants in the Maltese Islands. *Government Printing Press*, Valletta, 35 pp.
- SAMMUT P.M., 1982. Eine Revision über die Tagfalterfauna (Lepidoptera–Rhopalocera) der Maltesischen Insel Gruppe. *Ent. Nach.*, 81: 71-78.
- SAMMUT P.M., 1984, A Systematic and Synonymic List of the Lepidoptera of the Maltese islands. *Neue Ent. Nach.*, 13: 124 pp.
- SAMMUT P.M., 2000. Il-Lepidoptera. Kullana Kulturali 12. PIN. *Il-Pieta*, x+246 pp.
- SCIBERRAS A 2012. Another record of *Aglais urticae* (Linnaeus, 1758) (Lepidoptera-Nymphalidae) in the Maltese Islands. *Central Med. Nat.*, 5 (3/4): 50-52.
- SCIBERRAS A. & SAMMUT J., 2012. Two specimens of *Hypolimnas misippus* (Linnaeus, 1764) (Lepidoptera-Nymphalidae) in the Maltese Islands. *Central Med. Nat.*, 5 (3/4): 57-58.
- SCHEMBRI S., 1977. A Review of the Lepidoptera (Papilionoidea) of the Maltese Islands. Lepidoptera Group of 1968. Suppl. 1. *Vejde*, 10 pp.
- SCHEMBRI S., 1986. *Nymphalis polychloros* L. (Lepidoptera: Nymphalidae). *Central Med. Nat.*, 1 (4): 84.
- SEGUNA A., 2013. *Nymphalis antiopa* (Linnaeus, 1758) in the Maltese Islands (Lepidoptera: Nymphalidae). *SHILAP Revta. lepid.*, 41 (164): 569-570.
- TENNENT J., 1996. The Butterflies of Morocco, Algeria and Tunisia. *Gem Publishing Co*, xxxvi+217 pp.
- TOLMAN T. & LEWINGTON R., 1997. Butterflies of Britain & Europe. *Harper Collins Publ.*, 320 pp.
- TSHIKOLOVETS V.V., 2011. Butterflies of Europe & the Mediterranean area. *Tshikolovets Publ.*, 544 pp.
- VALLETTA A., 1948. *Polygonia agea* Cramer, in Malta. *Entomologist*, 81: 150-151.
- VALLETTA A., 1966. The Butterflies of the Maltese Islands. *Ent. Record*, 78: 38-42.
- VALLETTA A., 1972. The Butterflies of the Maltese Islands. *Progress Press*, 64 pp.
- VALLETTA A., 1974. The Butterflies of the Maltese Islands. *Ent. Record*, 86: 196.
- VALLETTA A., 1979. *Polygonia agea* Cr., in Malta. *Ent. Record*, 92: 97.
- VALLETTA A., 1985. *Agrodiaetus thersites* Cantener: Chapman's Blue in Malta. *Ent. Record*, 97 (5-6): 110.
- VODĀ R., DAPPORTO L., DINČĀ V., SHREEVE T.G., KHALDI M., BARECH G., REBBAS K., SAMMUT P., SCALERCIO S., HEBERT P.D.N. & VILA R., 2016. Historical and contemporary factors generate unique butterfly communities on islands. *Scientific Reports*, 6: 1-11.

Author's Address — L.F. CASSAR, Institute of Earth Systems, University of Malta; e-mail: louis.f.cassar@um.edu.mt

