

## Article

# A Critical Checklist of the Marine Fishes of Malta and Surrounding Waters

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**Abstract:** A critical review of marine fishes from Malta (Central Mediterranean) recorded up to December 2022 in the technical and semi-popular literature, during the Mediterranean International Trawl Survey (MEDITS), and in commercial fisheries landings data, was undertaken with the main aim of producing a checklist of species whose occurrence in the seas around the Maltese Islands could be authenticated. This review also served to generate two other lists: one of the species whose occurrence around the islands is probable or possible but which require confirmation, and a second list of previously reported species whose occurrence was deemed highly unlikely and which were hence excluded; the reasons for such exclusion are given. A total of 412 species were confirmed as occurring in Maltese waters, 53 species were listed as requiring confirmation, and 78 species were excluded. Of the species whose occurrence around the Maltese Islands was confirmed, 370 were native; 17 were non-established aliens; seven were established aliens; three were non-established Atlantic immigrants; five were established Atlantic immigrants; nine were non-established cryptogenic; and one was an established cryptogenic. The 412 confirmed species from the Maltese Islands represent 54% of the Mediterranean fish species that have been recorded in recently published works. Therefore, considering the geographical location of the islands at the centre of the Mediterranean, they provide a presumed ideal siting for a good representation of the marine ichthyological fauna. The Maltese checklist appears to still be short of many fish species that probably occur locally and have yet to be added to the present confirmed list. Nevertheless, the present review serves as a good indication of the current situation of the Maltese fish fauna, also noting that checklists for the group from neighbouring countries are somewhat outdated and require review and updating.

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**Keywords:** Actinopteri; alien species; Chondrichthyes; Elasmobranchii; faunistics; marine ichthyofauna; Osteichthyes; Petromyzonti

## 1. Introduction

Fish, being mostly conspicuous, mobile animals familiar to sea users, coastal dwellers, and casual visitors and, for some species at least, having economic significance, are one of the best-known marine faunal groups. The vast literature on Mediterranean fishes, including those of the central region [1–4], means it is perhaps surprising that despite this good regional information, there is rather limited knowledge on the fishes that occur around the Maltese Islands. However, the available information suggests that the marine ichthyofauna of Maltese waters is very rich and diverse [5]. Very likely, this is partly due to the Islands' geographical location at the centre of the Mediterranean, where there is both a transition in biogeographical characteristics from west to east and changes in these characteristics as a result of the ongoing modifications to Mediterranean hydrological conditions and to ecology resulting from global climate change [6]. The Maltese Islands also

have an intermediate position in the latitudinal gradient between the European Mediterranean shores and the North African coast and are, therefore, strongly influenced by north–south biogeographical changes. Moreover, a high diversity of marine habitats characterizes Maltese marine waters, both inshore and offshore, which also contributes to the high species richness and diversity of the marine fish fauna. On the other hand, non-marine ichthyofauna is almost non-existent. As there are no lakes, rivers, streams, or lagoons on the islands, fish species associated with such habitats are absent, with a single exception, that of *Aphanius fasciatus* (Valenciennes), which occurs permanently in transitional waters with fluctuating salinities [7].

The bulk of the literature on Maltese fishes is popular and semi-popular in nature and, more often than not, deals with the larger inshore and epipelagic species, especially those of the fisheries importance. In some cases, the literature includes species whose occurrence is doubtful on biogeographical grounds or due to difficult taxonomy. There is some literature that approaches the subject more scientifically, focusing on taxonomy and faunistics (e.g., [8,9]) and on ecological aspects (e.g., [10–12]). However, cryptic and deep-water fishes have been mostly neglected. The inclusion of Malta in regional and global checklists and databases (e.g., [13]) is based on the few scientific and technical works that have been published but very often also list species whose area of distribution should include the Maltese Islands, whether they have been actually recorded or not. These and other difficulties are indicated in the brief overview of the published records for Malta that follows.

### 1.1. Brief Overview of Published Lists of Maltese Fish Fauna

Publications on the ichthyofauna of the Maltese Islands date back to the middle of the 18th Century when Pehr Forsskål produced the earliest known scientific list of Maltese fishes comprising 114 species [14]. During the 19th and 20th centuries, several works were published on the Maltese ichthyofauna, notably by Trapani [15], Gavino Gulia [16,17], Tagliaferro [18], Giovanni Gulia [19–23], and Despott [24,25].

More recently, a seminal work on Maltese ichthyology was the comprehensive illustrated catalogue of local fishes by Guido Lanfranco, published in 1958 and republished in several editions [26–30]; however, the 2009 edition [30] was a simplified version of the 1993 work [29] and did not include new records that were published since the previous edition. In 1996, Gerald H. Jennings published a guide to the fishes of Malta [31]; this volume, illustrated with line drawings, included many previously unrecorded species, which, however, are doubtful at best and are therefore of limited scientific value. Two books that were published at the turn of the last century were *The Fishes of Malta* [32] and *Mediterranean Sea Fishes (Central Region)* [33].

The 21st century saw the publication of a number of ichthyological papers in local and international journals, mostly focused on a particular species or groups of species (e.g., [11,34–37]). A paper on sharks and rays from Maltese waters, published in 2003 [9], was the first comprehensive critical checklist of the local elasmobranch fauna. These and other recent scientific contributions (e.g., [8,38]) comprise a valuable addition to the knowledge of the fishes which are found in Maltese waters, especially considering the recent appearance of a number of Red Sea and Atlantic immigrants, which are attributed to the warming of Mediterranean surface waters. Nevertheless, it is clear that the several doubtful records and other difficulties highlighted above necessitate an in-depth critical review of the Maltese ichthyofauna to screen out those species which do indeed occur from those whose occurrence is not authenticated.

### 1.2. Fisheries Data—A Valuable Source of Information on Maltese Fish Fauna

An additional source of valuable information on fish fauna is fisheries data, including both fisheries-independent and fisheries-dependent data sources. In the European Union (EU), fisheries resources are managed through the implementation of the Common Fisheries Policy (CFP; Regulation (EU) No 1380/2013). Malta has been collecting fisheries data

in line with CFP requirements since joining the EU in 2004, most recently in line with the rules set out in Regulation (EU) 2017/1004 on the collection, management, and use of data in the fisheries sector and support for scientific advice regarding the CFP. Commercial fisheries data are submitted to the EU's Joint Research Centre (JRC) on an annual basis and analysed by Expert Working Groups (EWGs) of the Scientific, Technical, and Economic Committee for Fisheries (STECF).

The Mediterranean International Trawl Survey (MEDITS) is a mandatory annual bottom trawl survey undertaken by all Mediterranean EU Member States, which collects data on the relative abundance of demersal and benthic species [39,40]. A useful reference that is routinely updated with MEDITS survey results is the 'TM list': a full taxonomic list of all Mediterranean species encountered in the various Geographic Sub-Areas (GSAs), including in waters surrounding the Maltese Islands (GSA 15).

In addition to the EU fisheries data collection provisions, Malta is also subject to the fisheries data collection requirements of the General Fisheries Commission for the Mediterranean (GFCM). Fisheries-related data are collected and transmitted in line with the GFCM Data Collection Reference Framework (DCRF) [41] and made publicly available on the United Nations Food and Agriculture Organisation (FAO) fisheries capture production database. GFCM expert working groups on stock assessment, marine environment, and small-scale and recreational fisheries analyse the data and provide advice to the GFCM Scientific Advisory Committee on Fisheries (SAC).

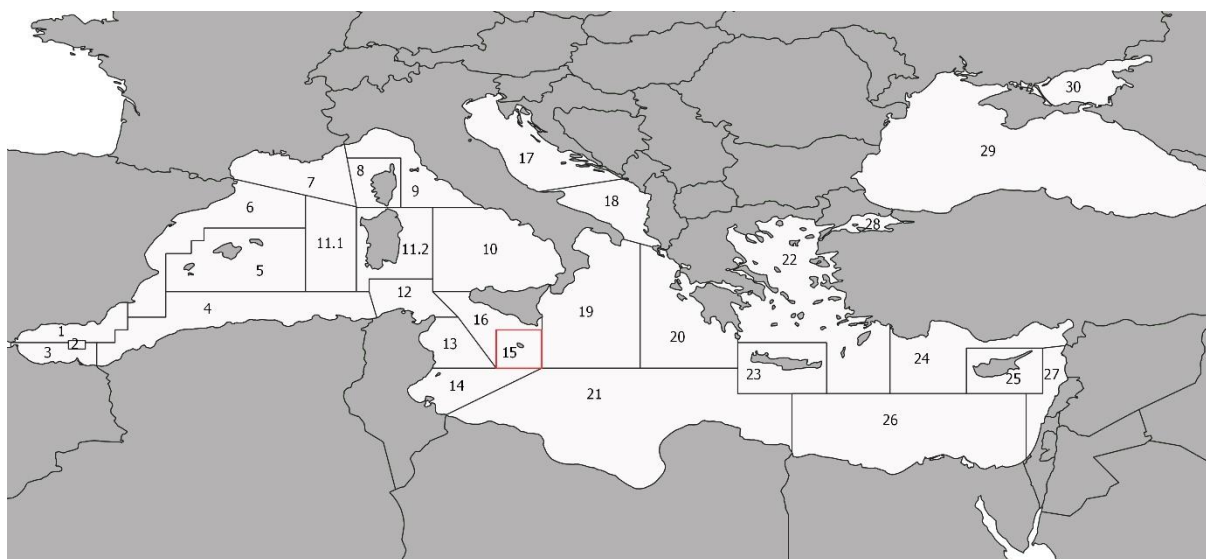
### *1.3. Aim of the Present Work*

To address the several doubtful records and other difficulties highlighted above, the present work aimed to undertake an in-depth review of the Maltese ichthyofauna in order to screen out those species which do indeed occur around Malta from those whose occurrence is not authenticated. Specifically, the present work comprises a critical review of published records of fish from Maltese waters, from the scientific, technical, and semi-popular literature, as well as species recorded during MEDITS and in commercial fisheries landings data. The main output of the present work is a checklist of species that have been confirmed to occur in Maltese waters. In producing this list, two other lists were generated: one that provides species whose occurrence is probable or possible but for which there are no authenticated records, and a second that lists species whose occurrence is excluded based on presently available scientific knowledge. The most recent authoritative checklist remains that which was made in 1993 by Lanfranco [29]; therefore, the compilation of an updated critical checklist of fish found in Maltese waters is long overdue.

## **2. Methods**

### *2.1. Study Area*

The study area considered in the present review is the marine area around the Maltese archipelago, taken here to be GSA 15 as established by the GFCM in 2009 (Figure 1). Malta is located in the western Ionian Sea, more or less at the centre of the Mediterranean in the biogeographical transition zone between the western and eastern basins [42,43]. The Maltese islands present an obstacle to the general surface water exchange between the western and eastern basins of the Mediterranean, and consequently, the offshore hydrodynamic regime and other physical oceanographic characteristics are quite complex [44,45]. Inshore, there is a predominant southeast current flow that is reinforced by waves generated by the prevailing north-westerly winds [44,46]. As for most of the Mediterranean, Maltese shores are microtidal (maximum tidal range = 0.20 m), with fluctuations in the mean water level of less than 0.5 m and mainly arising from differences in atmospheric pressure [47].



**Figure 1.** Map of the Mediterranean Sea indicating the boundaries of the Geographic Sub-Areas (GSAs) established by the General Fisheries Commission for the Mediterranean in 2009; the study area considered in the present work (GSA 15) is shown in red.

Values of the sea surface temperature around the Maltese Islands typically range between 15 °C and 25 °C. However, the mean sea temperature increased by 1.9 °C during the period 1978–2020, with high values reaching 30 °C [48,49] (Malta International Airport Met Office, personal communication, 6 December 2022). Inshore salinity normally ranges between 37.1 and 37.8 ppt but may fluctuate widely in very sheltered bays and inlets and in semi-enclosed creeks [50]. Maltese coastal waters are generally oligotrophic, with levels of dissolved nitrate and phosphate not exceeding 20 µg at N/L and 0.3 µg at P/L, respectively [50].

To the north and northeast of Malta, the seabed between the Maltese Islands and southern Sicily is a vast shallow continental shelf whose depth does not exceed 200 m, with a few banks rising close to the surface, while to the southwest of Malta, bathyal depths are present relatively close to the coast since the islands are situated on the northeastern flank of the Malta Graben: the deepest trough of the Pantelleria Rift system. The southwestern coast of the islands is characterised mainly by high cliffs, while the north-eastern coast is characterised by gently sloping shores [51].

The main habitat types in Maltese shallow (0–45 m) coastal areas are typical of the Mediterranean and include rocky shores and shallow (usually down to a depth of around 6 m) rocky infralittoral areas, which in places are covered with accumulations of boulders and/or of pebbles and cobbles, and sandy bottoms that in many places support extensive *Posidonia oceanica* seagrass beds down to a depth of around 45 m [52]. Extensive rocky reefs occur in several places at a depth of between 0 m and 100 m, some of which—particularly ones located several kilometres offshore—have a high ecological value in terms of habitats for fish, including species of commercial importance. Where rocky reefs are absent, the seabed within the 6–100 m depth range mainly comprises bare fine sands, which may support rhodolith beds that, in places, form a maerl bottom [53,54]. Remote operated vehicle (ROV) surveys of deep-sea (200–1000 m) areas around the Maltese Islands have indicated the presence of highly diverse habitats that include extensive rocky areas dominated by living cold-water scleractinian and gorgonian coral assemblages, a sub-fossil lithistid sponge reef, deep-water caves, and vast expanses of soft-bottoms that support a high species richness and abundance of echinoderms and crustaceans [55].

## 2.2. Review

A checklist of species that have been reported to occur in Maltese waters in December 2022 was compiled by critically reviewing the compilations by Lanfranco (1993), Jennings (1996), Falzon (1999), Farrugia Randon & Sammut (1999), Sammut (2001), Schembri et al. (2003), and Ragonese et al. (2013) [9,12,29,31–33,56]. Although the relevant pre-1950 literature [15–25,57] provides much useful information, the taxonomy used is outdated, not only because of changes in generic and specific allocation due to better phylogenetic knowledge and the rules of taxonomy, but also because of misidentifications and what are now known to be distinct species previously lumped together under one name. Guido Lanfranco resolved this old nomenclature to the extent possible and included records from the historical literature in his catalogues [26–29]. We, therefore, do not repeat historical records here and consider the fishes reported in Lanfranco's earliest catalogue and subsequently.

The present authors also consulted the scientific literature dealing with records from GSA 15; data from the annual Mediterranean International Trawl Survey submitted by the Maltese fisheries authorities as required by EU fisheries data collection regulations [58,59]; and commercial fisheries landings data [60,61]. The online database 'Fishbase' [13] was consulted, especially on aspects of the distribution of species, and the FAO species catalogues and guides (available from the FAO FishFinder website) were consulted on aspects of species taxonomy and distribution. The nomenclature and classification of species follow the World Register of Marine Species (WORMS) (online at <https://www.marinespecies.org/> (accessed on 19 December 2022)).

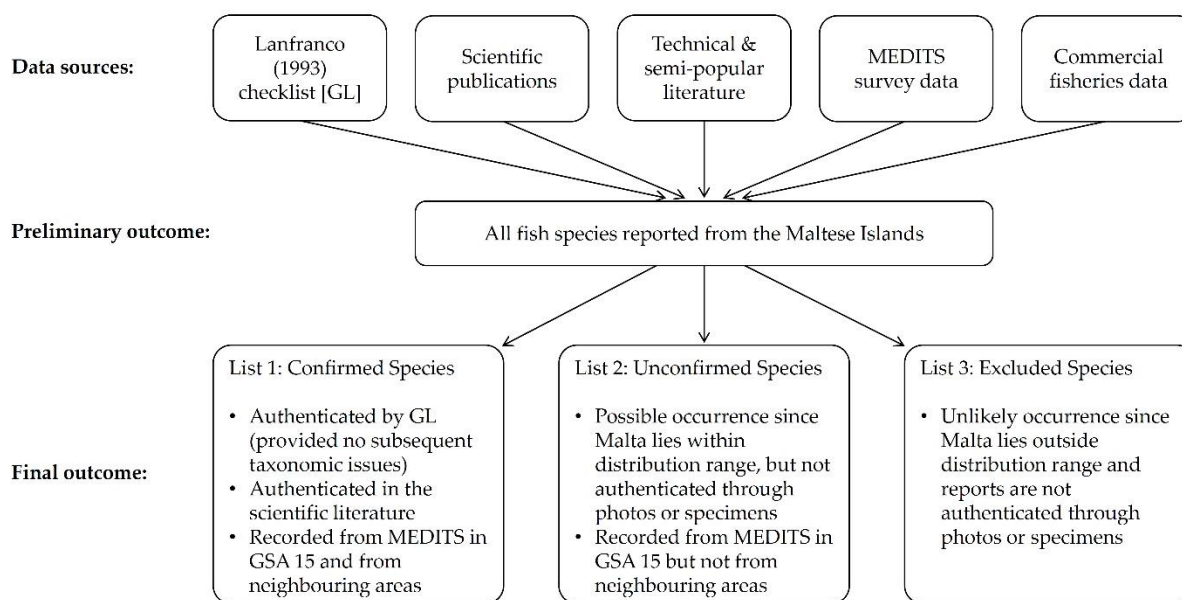
All species recorded from Maltese waters through these multiple data sources were then reviewed in order to classify the species into three categories: ones that are confirmed as occurring in Maltese waters, ones that may occur but whose presence requires confirmation, and those that should be excluded (Figure 2). Species records supported by actual specimens or authenticated in the scientific literature were accepted as 'occurring' and were included in the 'confirmed' list for Malta. Since Lanfranco (1993) personally verified most of the records listed in his work [29], his records were accepted as being authenticated by him except in cases where the author himself expressed doubt or in the case of species that were subsequently shown to present taxonomic problems. Where necessary, a brief explanatory note was included next to the species. For species that are historically known to have occurred but for which no recent records are available, the note 'occurred historically but there are no recent records' was included. For ones whose genus is known but where the species identity is doubtful, an explanatory note concerning this difficulty was included. Species commonly recorded during MEDITS in Maltese waters (GSA 15) as well as from neighbouring areas (namely, GSAs 13, 14, 16, 19, or 21; see Figure 1) were also included in the 'confirmed' list, even if no specimens or images were available.

Alien or other newcomer species with records from Maltese waters authenticated in the scientific literature were included as confirmed in the checklist (List A1 in Appendix A), together with an indication of their origin (Atlantic immigrant, cryptogenic, or alien) and current status (established or non-established). 'Atlantic immigrants' were taken to include vagrant or range-expanding species arriving in Malta autonomously; 'alien' species were taken as those whose presence in the Mediterranean was directly or indirectly attributable to human activities; the term 'cryptogenic' is used when there was doubt regarding the origin of a species, particularly for Eastern Atlantic species that are only known from single records. Species were assigned to these categories according to the criteria of Evans et al. [62].

Species were considered 'unconfirmed' if Malta lay within their distribution range, but their presence in Maltese waters was not authenticated through a photograph or specimen. Species that were only recorded in Maltese waters during MEDITS but not from neighbouring areas and which were not supported by actual specimens were also included in the 'unconfirmed' list (List A2 in Appendix A) if their presence in Malta was deemed possible based on their geographic distribution. All other species for which Malta

was not in the area of occurrence and records of which were neither supported by actual specimens nor by reports in the scientific literature were considered not to be present and listed as 'excluded' in a separate list (List A3 in Appendix A). In all cases, justification notes for treating a species as 'unconfirmed' or 'excluded' were included in the respective lists.

Commercial fisheries landings data were also reviewed to identify any additional species recorded from Maltese waters that had not already been listed based on the scientific literature or MEDITS data. Two sources of data were used for this: (i) transversal fisheries data (i.e., data on fishing effort, weight, and value of landings) for the years 2008–2020 published by the 2021 STECF EWG on the Annual Economic Report on the EU fishing fleet [61], and (ii) the FAO GFCM (Mediterranean and Black Sea) Capture Production database for the years 1970–2019 [60]. Species with rare landings records (i.e., restricted to three years or less), with no preserved specimens, and with records lacking morphometric measurements or meristic counts were also assigned to the 'excluded' list.



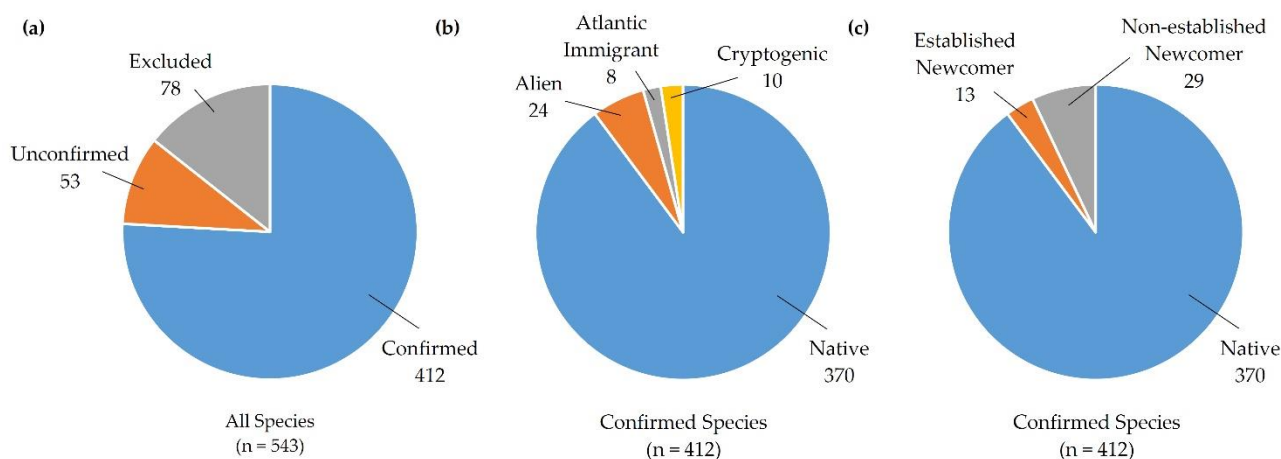
**Figure 2.** Schematic figure detailing the process used to compile the critical checklist of marine fishes recorded from Maltese waters.

### 3. Results

One species from the Petromyzonti, 62 species from the Elasmobranchii, and 349 species from the Actinopteri, were confirmed to occur or to have occurred in Maltese waters, such that the current total number of marine fish species recorded from Malta stands at 412 (see Figure 3 and List A1 in Appendix A). Of the Elasmobranchii, six species (see List A1 in Appendix A) are indicated as having occurred historically but for which no recent records are available, and one species (*Squalus* sp.) requires confirmation of identity and could possibly have been a new species. All the recorded Elasmobranchii species are native to the Mediterranean. Of the Actinopteri, the genus *Sphyræna* Ardeï is present as two species, one of which is confirmed to be *S. viridensis* Cuvier but the other species requires confirmation of identity; the only occurring species of *Elops* Linnaeus requires confirmation of identity; *Pagrus caeruleostictus* (Valenciennes) is the confirmed species rather than *Evynnis ehrenbergi* (Valenciennes) which is reported as *P. ehrenbergi* in the literature [32,33]; a species from the genus *Sargocentron* Fowler requires confirmation of identity. Several of the Actinopteri are non-native species, 17 are non-established aliens, seven are established aliens, three are non-established Atlantic immigrants, five are established Atlantic immigrants, nine are non-established cryptogenic, and one is an established cryptogenic.

Seven species from the Elasmobranchii and 46 from the Actinopteri, i.e., a total of 53 fish, were assigned to the list of species whose occurrence around the Maltese Islands requires confirmation (List A2 in Appendix A). Brief justification notes for including these species in this list are given. The species requiring confirmation are mostly the Carcharidae (5 species), Gobiidae (10 species), and Myctophidae (10 species).

Five species from the Elasmobranchii and 73 from the Actinopteri, i.e., a total of 78 fish, were assigned to the list of species whose occurrence around the Maltese Islands is excluded (List A3 in Appendix A). Brief explanatory notes that establish the fact that these species do not occur locally are given. The group with the greatest number of excluded species (20) is the family Gobiidae.



**Figure 3.** Categorization of fish species recorded from Maltese waters. (a) Number of fish species that are confirmed as occurring in Maltese waters, that may occur but are unconfirmed, and that should be excluded from the checklist of Maltese fish fauna; (b) Number of native and newcomer species confirmed as occurring in Maltese waters, with newcomers classified according to origin; (c) Number of native and newcomer species confirmed as occurring in Maltese waters, with newcomers classified according to origin establishment status.

#### 4. Discussion

The scientific, technical, and semi-popular literature and fisheries data include some 543 fish species occurring in Maltese waters; however, the present confirmed list comprises only 412 species. The critical analyses undertaken as part of the present work have removed 78 species as unlikely to occur. Some of these were recorded as a result of misidentification resulting from similarities with conspecifics, while others have been erroneously recorded without plausible justification, including some which are not even known to occur in the Mediterranean Sea. An appreciable number of species (53) may or may not occur, and their occurrence, therefore, requires confirmation or otherwise through future work. Undoubtedly, there will be a transfer of species from the ‘unconfirmed’ list to the confirmed one, thereby expanding the checklist of fishes from Maltese waters. Such additions to the Maltese checklist are predicted to result from new records of fishes from deep waters, species for which to date no specimen has yet been available for proper identification, and newly recorded non-native species, which up to 2021 have reached a total of 168 for the Mediterranean [63].

Lanfranco’s checklist of Maltese fish species [29], which the present authors deemed the most reliable of all the locally published lists, includes 288 species that are confirmed through the present work. The 124 species added to the confirmed list through the present work mostly comprise native Mediterranean fishes that were recorded from Malta subsequent to the publication of Lanfranco’s 1993 work, although 32 of them are non-native and cryptogenic species, and eight are recent Atlantic immigrants. Amongst the 42 newcomer species included in the present confirmed list, only *Alepes djedaba* Forsskål and

*Stephanolepis diaspros* Fraser-Brunner were recorded by Lanfranco (1993) [29]; the rest are all more recent additions to the Maltese ichthyofauna.

In their evidence-based checklist, Kovačić et al. listed a total of 759 fish species from the Mediterranean Sea [63]. The 412 confirmed species from the present work represent 54% of the Mediterranean marine fish species recorded by Kovačić et al. [63]. The total number of fish species that were confirmed as occurring in Maltese waters was broadly similar to that recorded from other sub-regions of the Mediterranean in recent checklists: Albania—262 species, Libya—304, Egyptian Mediterranean—364, Lebanon—376, northern Tyrrhenian Sea—426, Turkish Levantine Sea—441, Adriatic Sea—444, southern Tyrrhenian Sea—447, Turkish Aegean Sea—449, Ligurian Sea—454, Israel—469, Spanish Mediterranean—498 [64–72].

The Mediterranean checklist by Kovačić et al. [63] indicates that the highest number of species among the Elasmobranchii are from the Carcharhinidae (44 species), Rajidae (19 species), and Dasyatidae (7 species). The number of species from the Carcharhinidae reported by these workers far exceeds that recorded by the present work (two species), but, on the other hand, the number of species recorded by the same authors for the Rajidae and Dasyatidae species is, arguably, close to those from the present checklist; fourteen and three species, respectively. For the Actinopteri, Kovačić et al. [63] indicated that the greatest number of species were from the Gobiidae (74 species), Sparidae (32 species), Blenniidae (24 species), Labridae (22 species), Carangidae (21 species) and Serranidae (21 species). For this Class, the number of species recorded from the present work is not much different for the Sparidae (24 species), Blenniidae (17 species), Labridae (17 species), Carangidae (15 species), and Serranidae (15 species). However, for the Maltese Gobiidae, the number of confirmed species from Malta is much lower (21 species). It appears, therefore, that the occurrence of species that are an important component of the local fisheries sector has been well reported, while information on species that are not landed by fishers, such as Carcharhinidae and Gobiidae, is lacking due to the unavailability of specimens. This reflects the difficulty of confirming the identity of species when actual specimens are unavailable; identification based on indirect information (imagery, observations made by third parties, etc.) often leads to erroneous identification. Even for species that are quite common in the fisheries sector, such as the barracudas, unavailability of specimens has resulted in uncertainty as to which species occur. The Blenniidae are an exception to this, as it seems that most Mediterranean species from this group have been recorded from Malta; this can be attributed to the particular effort expended by Falzon [56] in surveying fishes from this family around the Maltese Islands.

The present critical review has resulted in the most extensive list of Maltese fishes published to date. An assessment of the Maltese fish fauna within the context of biogeographical affinities was beyond the scope of the present study, although the present authors intend to follow on this in separate future work. Three lists, one with 412 confirmed species, a second with 53 species that require confirmation, and a third comprising 78 species that are deemed not to occur in Maltese coastal waters, have been generated.

These lists are expected to be useful for local conservation and fishery management by contributing data on the distribution of fish at the Mediterranean regional level. The checklists are useful tools for fisheries scientists when compiling and checking data from fisheries surveys and catch monitoring, for instance, during the annual review of the MEDITS TM list. The lists also highlight gaps in knowledge that need to be addressed and, as such, can be used as a starting point for future research. For example, the collection of samples for some of the more commonly encountered unconfirmed species, such as Myctophidae and Sphyraenidae, during MEDITS surveys and fish market monitoring could be prioritized.

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original draft, J.A.B.; Writing – review & editing, D.D., J.E., L.K. and P.J.S. All authors have read and agreed to the published version of the manuscript.

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**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A

### List A1. Species confirmed as occurring in Maltese waters

Species that are considered to be newcomers (alien, Atlantic immigrant, or cryptogenic) are annotated, accordingly, together with their establishment status. Species that are not annotated as such are considered to be native.

#### Class Petromyzonti

##### Order Petromyzontiformes

##### Family Petromyzontidae

*Petromyzon marinus* Linnaeus, 1758 [29,32,33]

Occurred historically but there are no recent records.

#### Class Elasmobranchii

##### Order Hexanchiformes

##### Family Hexanchidae

*Heptranchias perlo* (Bonneterre, 1788) [9,12,29,31–33,58,59]

*Hexanchus griseus* (Bonneterre, 1788) [9,12,29,31–33,58,59]

##### Order Lamniformes

##### Family Odontaspidae

*Odontaspis ferox* (Risso, 1810) [9,29,31–33]

##### Family Lamnidae

*Carcharias taurus* Rafinesque, 1810 [9,29,32,33]

Occurred historically but there are no recent records [9]

*Charcharodon charcharias* (Linnaeus, 1758) [9,29,31–33]

*Isurus oxyrinchus* Rafinesque, 1810 [9,29,32,33]

*Lamna nasus* (Bonneterre, 1788) [29,32,33]

##### Family Cetorhinidae

*Cetorhinus maximus* (Gunnerus, 1765) [29,32,33]

##### Family Alopiidae

*Alopias superciliosus* Lowe, 1841 [9]

*Alopias vulpinus* (Bonneterre, 1788) [9,29,31–33]

##### Order Carcharhiniformes

**Family Pentanchidae**

*Galeus melastomus* Rafinesque, 1810 [12,29,31,32,59,59]

**Family Scyliorhinidae**

*Scyliorhinus canicula* (Linnaeus, 1758) [9,12,29,31–33,58,59]

*Scyliorhinus stellaris* (Linnaeus, 1758) [9,12,29,31–33,58,59]

**Family Triakidae**

*Galeorhinus galeus* (Linnaeus, 1758) [9,12,29,32,33]

Occurred historically but there are no recent records [9]

*Mustelus asterias* Cloquet, 1819 [9,12,29,32,33,58,59]

*Mustelus mustelus* (Linnaeus, 1758) [9,12,29,32,33,58,59]

*Mustelus punctulatus* Risso, 1827 [9,58,59]

**Family Carcharhinidae**

*Carcharhinus obscurus* (Lesueur, 1818) [9,73]

*Prionace glauca* (Linnaeus, 1758) [9,29,32,33]

**Family Sphyrnidae**

*Sphyrna zygaena* (Linnaeus, 1758) [9,29,32,33]

**Order Squaliformes****Family Dalatiidae**

*Dalatias licha* (Bonnaterre, 1788) [9,12,29,32,33,58,59]

**Family Etmopteridae**

*Etmopterus spinax* (Linnaeus, 1758) [9,12,29,31–33,58,59]

**Family Somniosidae**

*Somniosus rostratus* (Risso, 1827) [74]

**Family Oxynotidae**

*Oxynotus centrina* (Linnaeus, 1758) [9,12,29,32,33,58,59]

**Family Centrophoridae**

*Centrophorus granulosus* (Bloch & Schneider, 1801) [9,12,29,31–33,58,59]

*Centrophorus uyato* (Rafinesque, 1810) [9,29,31–33,58,59]

**Family Squalidae**

*Squalus acanthias* Linnaeus, 1758 [9,29,31–33,58,59]

*Squalus blainville* (Risso, 1827) [9,12,29,31–33,58,59]

*Squalus* sp. Linnaeus, 1758 [75]

The presence of a species of *Squalus* that is genetically distinct from both *S. blainville* and the morphologically similar *S. megalops* was confirmed by Ferrari et al. [75]. However, the exact identity of this species has not been established; this may represent a new species that has not yet been formally described.

**Order Echinorhiniformes****Family Echinorhinidae**

*Echinorhinus brucus* (Bonnaterre, 1788) [9,29,31–33]

**Order Squatiniformes****Family Squatinidae**

*Squatina aculeata* Cuvier, 1829 [9,58,59,76]

*Squatina oculata* Bonaparte, 1840 [9,12,29,31–33,58,59]

*Squatina squatina* (Linnaeus, 1758) [9,12,29,31–33,58,59]

**Order Rhinopristiformes****Family Pristidae**

*Pristis pristis* (Linnaeus, 1758) [29,32,33]

Occurred historically but there are no recent records [9]

**Family Rhinobatidae**

*Glaucoctegus cemiculus* Geoffroy Saint-Hilaire, 1817 [29,32,33]

Occurred historically but there are no recent records [9]

*Rhinobatos rhinobatos* (Linnaeus, 1758) [29,31–33]

Occurred historically but there are no recent records [9]

### **Order Torpediniformes**

#### **Family Torpedinidae**

*Tetronarce nobiliana* Bonaparte, 1835 [29,31–33,58,59]

*Torpedo marmorata* Risso, 1810 [9,29,31–33,58,59]

*Torpedo torpedo* (Linnaeus, 1758) [29,31–33]

### **Order Rajiformes**

#### **Family Rajidae**

*Dipturus batis* (Linnaeus, 1758) [29,31–33]

*Dipturus oxyrinchus* (Linnaeus, 1758) [9,29,32,33,58,59]

*Leucoraja circularis* (Couch, 1838) [31,58,59]

*Leucoraja fullonica* (Linnaeus, 1758) [29,31–33,58,59]

*Leucoraja melitensis* (Clark, 1926) [9,29,32,33,58,59]

*Raja asterias* Delaroche, 1809 [9,29,31–33,58,59]

*Raja brachyura* Lafont, 1871 [31,58,59]

*Raja clavata* Linnaeus, 1758 [9,29,31–33,58,59]

*Raja miraletus* Linnaeus, 1758 [9,29,31–33,58,59]

*Raja montagui* Fowler, 1910 [9,58,59]

*Raja polystigma* Regan, 1923 [31,58,59]

*Raja radula* Delaroche, 1809 [9,29,31–33,58,59]

*Raja undulata* Lacepède, 1802 [58,59]

*Rostroraja alba* (Lacepède, 1803) [9,31–33,58,59]

### **Order Myliobatiformes**

#### **Family Dasyatidae**

*Bathytoshia centroura* (Mitchill, 1815) [9,29,31–33,58,59]

*Dasyatis pastinaca* (Linnaeus, 1758) [9,29,31–33,58,59]

*Pteroplatytrygon violacea* (Bonaparte, 1832) [29,31–33,77]

#### **Family Gymnuridae**

*Gymnura altavela* (Linnaeus, 1758) [9,29,31–33]

#### **Family Myliobatidae**

*Aetomylaeus bovinus* (Geoffroy Saint-Hilaire, 1817) [9,29,31–33,58,59]

*Mobula mobular* (Bonnaterre, 1788) [9,29,31–33]

*Myliobatis aquila* (Linnaeus, 1758) [9,29,31–33,58,59]

*Rhinoptera marginata* (Geoffroy Saint-Hilaire, 1817) [9,29]

### **Order Chimaeriformes**

#### **Family Chimaeridae**

*Chimaera monstrosa* Linnaeus, 1758 [12,29,31–33,58,59]

### **Class Actinopteri**

#### **Subclass Chondrostei**

### **Order Acipenseriformes**

#### **Family Acipenseridae**

*Acipenser sturio* Linnaeus, 1758 [29,31–33]

### **Subclass Teleostei**

### **Order Acanthuriformes**

#### **Family Acanthuridae**

*Acanthurus chirurgus* (Bloch, 1787) [78]: non-established alien  
*Acanthurus coeruleus* Bloch & Schneider, 1801 [37]: non-established alien  
*Acanthurus monroviae* Steindachner, 1876 [79]: established Atlantic immigrant  
*Naso annulatus* (Quoy & Gaimard, 1825) [80]: non-established alien

#### **Family Caproidae**

*Capros aper* (Linnaeus, 1758) [29,31–33,58,59]

#### **Family Chaetodontidae**

*Heniochus intermedius* Steindachner, 1893 [37]: non-established alien

#### **Family Lobotidae**

*Lobotes surinamensis* (Bloch, 1790) [31,81]

#### **Family Luvariidae**

*Luvarus imperialis* Rafinesque, 1810 [29,31–33]

#### **Family Pomacanthidae**

*Holacanthus africanus* Cadenat, 1951 [82]: non-established alien

*Holacanthus ciliaris* (Linnaeus, 1758) [83]: non-established cryptogenic

*Pomacanthus maculosus* (Forsskål, 1775) [84]: non-established alien

#### **Family Scatophagidae**

*Scatophagus argus* (Linnaeus, 1766) [85]: non-established alien

#### **Family Siganidae**

*Siganus luridus* (Rüppell, 1829) [31,34,86]: established alien

### **Order Acropomatiformes**

#### **Family Epigonidae**

*Epigonus constanciae* (Giglioli, 1880) [58,59]

*Epigonus denticulatus* Dieuzeide, 1950 [58,59]

*Epigonus telescopus* (Risso, 1810) [31,34,58,59]

#### **Family Polyprionidae**

*Polyprion americanus* (Bloch & Schneider, 1801) [29,31–33]

### **Order Anguilliformes**

#### **Family Anguillidae**

*Anguilla anguilla* Linnaeus, 1758 [29,31–33]

#### **Family Chlopsidae**

*Chlopsis bicolor* Rafinesque, 1810 [87]

#### **Family Congridae**

*Ariosoma balearicum* (Delaro, 1809) [29,31–33]

*Conger conger* (Linnaeus, 1758) [29,31–33,58,59]

*Gnathophis mystax* (Delaroche, 1809) [58,59]

#### **Family Muraenidae**

*Enchelycore anatina* (Lowe, 1838) [88]: non-established Atlantic immigrant

*Gymnothorax unicolor* (Delaroche, 1809) [29,32,33]

*Muraena helena* Linnaeus, 1758 [29,31–33,58,59]

#### **Family Nettastomatidae**

*Facciolella oxyrhynchus* (Bellotti, 1833) [58,59]

*Nettastoma melanurum* Rafinesque, 1810 [29,31–33,58,59]

#### **Family Ophichthidae**

*Aptेरichtus caecus* (Linnaeus, 1758) [29,32,33]

*Dalophis imberbis* (Delaroche, 1809) [29,31–33,58,59]

*Echelus myrus* (Linnaeus, 1758) [29,32,33,58,59]

*Ophichthus rufus* (Rafinesque, 1810) [29,32,33,58,59]

*Ophisurus serpens* (Linnaeus, 1758) [29,31–33]

### **Order Atheriniformes**

#### **Family Atherinidae**

*Atherina boyeri* Risso, 1810 [29,31–33]  
*Atherina hepsetus* Linnaeus, 1758 [29,31–33]

### Order Aulopiformes

#### Family Aulopidae

*Aulopus filamentosus* (Bloch, 1792) [29,58,59]

#### Family Chlorophthalmidae

*Chlorophthalmus agassizi* Bonaparte, 1840 [29,32,33,58,59]

#### Family Ipnopidae

*Bathypterois mediterraneus* Bauchot, 1962 [58,59]

Some authors regard *B. mediterraneus* as a junior synonym of *B. dubius* (e.g., [89]), but since both taxa are currently considered to be valid by FishBase, we consider all *Bathypterois* recorded in Maltese waters to be *B. mediterraneus*; the Atlantic species (*B. dubius*) is likely to be mostly limited to the westernmost Mediterranean.

#### Family Paralepididae

*Lestidiops sphyrenoides* (Risso, 1820) [29,31]

*Paralepis coregonoides* Risso, 1820 [29,31]

*Sudis hyalina* Rafinesque, 1810 [29,31,58,59]

#### Family Synodontidae

*Synodus saurus* (Linnaeus, 1758) [29,31–33,58,59]

### Order Beloniformes

#### Family Belonidae

*Ablennes hians* (Valenciennes, 1846) [90]: non-established cryptogenic

*Belone belone* (Linnaeus, 1761) [29,31–33]

*Tylosurus acus* (Lacepède, 1803) [29,31–33]

#### Family Exocoetidae

*Cheilopogon heterurus* (Rafinesque, 1810) [29,31–33]

*Hirundichthys rondeletii* (Valenciennes, 1847) [29,31–33]

#### Family Scomberesocidae

*Scomberesox saurus* (Walbaum, 1792) [29,31–33]

### Order Beryciformes

#### Family Trachichthyidae

*Hoplostethus mediterraneus* Cuvier, 1829 [29,31–33,58,59]

### Order Blenniiformes

#### Family Blennidae

*Aidablennius sphyinx* (Valenciennes, 1836) [29,31–33,56]

*Coryphoblennius galerita* (Linnaeus, 1758) [56]

*Blennius ocellaris* Linnaeus, 1758 [29,31–33,58,59]

*Lipophrys trigloides* (Valenciennes, 1836) [29,31–33,56]

*Microlipophrys caneuae* (Vinciguerra, 1880) [56]

*Microlipophrys dalmatinus* (Steindachner & Kolombatovic, 1883) [35]

*Microlipophrys nigriceps* (Vinciguerra, 1883) [91]

*Ophioblennius atlanticus* (Valenciennes, 1836) [92]: non-established cryptogenic

*Parablennius gattorugine* (Linnaeus, 1758) [29,31–33,56,93]

*Parablennius incognitus* (Bath, 1968) [29,32,33,56,94]

*Parablennius pilicornis* (Cuvier 1829) [56]

*Parablennius rouxi* (Cocco, 1833) [31,56]

*Parablennius sanguinolentus* (Pallas, 1814) [29,31–33,56]

*Parablennius tentacularis* (Brünnich, 1768) [29,31–33]

*Parablennius zvonimiri* (Kolombatovic, 1892) [29,31–33,56]

*Salaria pavo* (Risso, 1810) [29,31–33,56]

*Scartella cristata* (Linnaeus, 1758) [29,56,94]

**Family Clinidae**

*Clinitrachus argentatus* (Risso, 1810) [29,31–33,56]

**Family Tripterygiidae**

*Tripterygion delaisi* Cadenat & Blache, 1970 [56]

*Tripterygion melanurum* Guichenot, 1850 [31–33,56]

*Tripterygion tripteronotum* (Risso, 1810) [29,31–33,56]

**Order Callionymiformes**

**Family Callionymidae**

*Callionymus lyra* Linnaeus, 1758 [29,31–33]

*Callionymus maculatus* Rafinesque, 1810 [29,31–33,58,59]

*Callionymus pusillus* Delaroche, 1809 [29,31–33]

*Callionymus risso* Lesueur, 1814 [29,31–33]

*Synchiropus phaeton* (Günther, 1861) [58,59]

**Order Carangiformes**

**Family Carangidae**

*Alectis alexandrina* (Geoffroy Saint-Hilaire, 1817) [29,32,33]

*Alepes djedaba* (Forsskål, 1775) [29,32,33]: established alien

*Campogramma glaycos* (Lacepède, 1801) [29,31–33]

*Caranx crysos* (Mitchill, 1815) [29,31–33]

*Caranx rhonchus* Geoffroy Saint-Hilaire, 1817 [29,31–33]

*Lichia amia* (Linnaeus, 1758) [29,31–33]

*Naucrates ductor* (Linnaeus, 1758) [29,31–33]

*Pseudocaranx dentex* (Bloch & Schneider, 1801) [29,31–33]

*Selene dorsalis* (Gill, 1863) [94]: non-established cryptogenic

*Seriola dumerili* (Risso, 1810) [29,31–33]

*Seriola fasciata* (Bloch, 1793) [95,96]: established Atlantic immigrant

*Trachinotus ovatus* (Linnaeus, 1758) [29,31–33]

*Trachurus mediterraneus* (Steindachner, 1868) [29,31–33,58,59]

*Trachurus picturatus* (Bowdich, 1825) [29,31–33,58,59]

*Trachurus trachurus* (Linnaeus, 1758) [29,31–33,58,59]

**Family Coryphaenidae**

*Coryphaena equiselis* Linnaeus, 1758 [29,31–33]

*Coryphaena hippurus* Linnaeus, 1758 [29,31–33]

**Family Echeneidae**

*Echeneis naucrates* Linnaeus, 1758 [29,31–33]

*Remora remora* (Linnaeus, 1758) [29,31–33]

**Family Istiophoridae**

*Tetrapturus belone* Rafinesque, 1810 [29,31–33]

**Family Xiphiidae**

*Xiphias gladius* Linnaeus, 1758 [29,31–33]

**Order Carangaria (*incertae sedis*)**

**Family Sphyraenidae**

*Sphyraena viridensis* (Cuvier 1829) [11,97]

As stated in FishBase, most published records do not separate this species from *S. sphyraena*, and past records of *S. sphyraena* from Malta should be attributed to *S. viridensis*.

*Sphyraena* sp./spp. Artdi, 1793

At least one other species of *Sphyraena* occurs in Maltese waters, but the identity of this/these species requires confirmation. See additional notes on unconfirmed Sphyraenidae in List 2.

**Order Centrarchiformes****Family Oplegnathidae**

*Oplegnathus fasciatus* (Temminck & Schlegel, 1844) [98]; non-established alien

**Family Kyphosidae**

*Kyphosus vaigiensis* (Quoy & Gaimard, 1825) [99]; non-established cryptogenic

**Order Clupeiformes****Family Clupeidae**

*Alosa fallax* (Lacepède, 1803) [29,31–33]

*Sardina pilchardus* (Walbaum, 1792) [29,31–33,58,59]

*Sardinella aurita* Valenciennes, 1847 [29,31–33,58,59]

*Sardinella maderensis* (Lowe, 1838) [29,31–33]

*Sprattus sprattus* (Linnaeus, 1758) [29,31–33]

**Family Engraulidae**

*Engraulis encrasicolus* (Linnaeus, 1758) [29,31–33,58,59]

**Order Cyprinodontiformes****Family Cyprinodontidae**

*Aphanius fasciatus* (Valenciennes, 1821) [29,31–33]

**Order Elopiformes****Family Elopidae**

*Elops* sp. Linnaeus, 1766 [100]: non-established alien

A substantiated record of an individual belonging to this genus confirms its presence in Maltese waters; however, the exact identity of the species has not been established.

**Order Eupercaria (*incertae sedis*)****Family Callanthiidae**

*Callanthias ruber* (Rafinesque, 1810) [29,31–33,58,59]

**Family Cepolidae**

*Cepola macrophthalma* (Linnaeus, 1758) [58,59]

**Family Haemulidae**

*Pomadasys incisus* (Bowdich, 1825) [101]

**Family Labridae**

*Acantholabrus palloni* (Risso, 1810) [29,31–33,58,59]

*Coris julis* (Linnaeus, 1758) [29,32,33,58,59]

*Labrus merula* Linnaeus, 1758 [29,31–33]

*Labrus viridis* Linnaeus, 1758 [29,31–33,58,59]

*Pteragogus trispilus* Randall, 2013 [102]: non-established alien

*Lappanella fasciata* (Cocco, 1833) [29,31–33]

*Symphodus cinereus* (Bonnaterre, 1788) [29,31–33,58,59]

*Symphodus doderleini* Jordan, 1890 [29,31–33]

*Symphodus mediterraneus* (Linnaeus, 1758) [29,31–33,58,59]

*Symphodus melanocercus* (Risso, 1810) [29,31–33]

*Symphodus melops* (Linnaeus, 1758) [29,31–33]

*Symphodus ocellatus* (Linnaeus, 1758) [29,31–33]

*Symphodus roissali* (Risso, 1810) [29,31–33]

*Symphodus rostratus* (Bloch, 1791) [29,31–33]

*Symphodus tinca* (Linnaeus, 1758) [29,31–33]

*Thalassoma pavo* (Linnaeus, 1758) [29,31–33]

*Xyrichtys novacula* (Linnaeus, 1758) [29,31–33]

**Family Lutjanidae**

*Lutjanus argentimaculatus* (Forsskål, 1775) [103]: non-established alien

*Lutjanus fulviflamma* (Forsskål, 1775) [104]: non-established alien

#### **Family Moronidae**

*Dicentrarchus labrax* (Linnaeus, 1758) [29,31–33]

*Dicentrarchus punctatus* (Bloch, 1792) [29,31–33]

#### **Family Scaridae**

*Sparisoma cretense* (Linnaeus, 1758) [29,31–33]

#### **Family Sciaenidae**

*Argyrosomus regius* (Asso, 1801) [29,31]

*Sciaena umbra* Linnaeus, 1758 [29,31–33,58,59]

*Umbrina canariensis* Valenciennes, 1843 [58,59]

*Umbrina cirrosa* (Linnaeus, 1758) [29,31–33]

#### **Family Sparidae**

*Boops boops* (Linnaeus, 1758) [29,31–33,58,59]

*Centracanthus cirrus* Rafinesque, 1810 [29,31–33,58,59]

*Dentex dentex* (Linnaeus, 1758) [29,31–33,58,59]

*Dentex gibbosus* (Rafinesque, 1810) [29,31–33,58,59]

*Dentex macrophthalmus* (Bloch, 1791) [29,31–33,58,59]

*Diplodus annularis* (Linnaeus, 1758) [29,31–33]

*Diplodus cervinus* (Lowe, 1838) [29,31–33]

*Diplodus puntazzo* (Walbaum, 1792) [29,31–33,58,59]

*Diplodus sargus* (Linnaeus, 1758) [29,31–33,58,59]

*Diplodus vulgaris* (Geoffroy Saint-Hilaire, 1817) [29,31–33,58,59]

*Lithognathus mormyrus* (Linnaeus, 1758) [29,31–33]

*Oblada melanurus* (Linnaeus, 1758) [29,31–33]

*Pagellus acarne* (Risso, 1827) [29,31–33,58,59]

*Pagellus bogaraveo* (Brünnich, 1768) [29,31–33,58,59]

*Pagellus erythrinus* (Linnaeus, 1758) [29,31–33,58,59]

*Pagrus auriga* Valenciennes, 1843 [29,31–33]

*Pagrus caeruleostictus* (Valenciennes, 1830) [29]

Very likely, the “*Pagrus ehrenbergi* (Valenciennes)” recorded by Farrugia Randon and Sammut [32] and Sammut [33] refer to this species since this name has in the past been misapplied to the present species.

*Pagrus pagrus* (Linnaeus, 1758) [29,31–33,58,59]

*Sarpa salpa* (Linnaeus, 1758) [29,31–33]

*Sparus aurata* Linnaeus, 1758 [29,31–33]

*Spicara flexuosa* Rafinesque, 1810 [29,32,58,59]

*Spicara maena* (Linnaeus, 1758) [29,32,58,59]

*Spicara smaris* (Linnaeus, 1758) [29,31–33,58,59]

*Spondylisoma cantharus* (Linnaeus, 1758) [29,31–33,58,59]

### **Order Gadiformes**

#### **Family Gadidae**

*Gadiculus argenteus* Guichenot, 1850 [29,31–33,58,59]

*Micromesistius poutassou* (Risso, 1827) [29,31–33,58,59]

*Trisopterus capelanus* (Linnaeus, 1758) [29,31–33,58,59]

#### **Family Lotidae**

*Gaidropsarus granti* (Regan, 1903) [87,105]: established cryptogenic

*Gaidropsarus mediterraneus* (Linnaeus, 1758) [29,31–33,58,59]

*Gaidropsarus vulgaris* (Cloquet, 1824) [29,31–33]

*Molva dypterygia* (Pennant, 1784) [29,31–33,58,59]

*Molva molva* (Linnaeus, 1758) [58,59]

#### **Family Macrouridae**

*Coelorinchus caelorinchus* (Risso, 1810) [31,58,59]

*Hymenocephalus italicus* Giglioli, 1884 [31,58,59]



*Nezumia aequalis* (Günther, 1878) [31,58,59]  
*Nezumia sclerorhynchus* (Valenciennes, 1838) [58,59]

#### **Family Merlucciidae**

*Merluccius merluccius* (Linnaeus, 1758) [29,31–33,58,59]

#### **Family Moridae**

*Gadella maraldi* (Risso, 1810) [32,33,58,59]  
*Mora moro* (Risso, 1810) [29,31–33,58,59]

#### **Family Phycidae**

*Phycis blennoides* (Brünnich, 1768) [29,31–33,58,59]  
*Phycis phycis* (Linnaeus, 1766) [29,31–33,58,59]

### **Order Gobiesociformes**

#### **Family Gobiesocidae**

*Apletodon incognitus* Hofrichter & Patzner, 1997 [8]  
*Diplecogaster bimaculata* (Bonnaterre, 1788) [29,31–33]  
*Gouania willdenowi* (Risso, 1810) [8]  
*Lepadogaster candolii* Risso, 1810 [29,31–33]  
*Lepadogaster lepadogaster* (Bonnaterre, 1788) [29,31–33]  
*Opeatogenys gracilis* (Canestrini, 1864) [8]

### **Order Gobiiformes**

#### **Family Gobiidae**

*Chromogobius zebratus* (Kolombatovic, 1891) [8,31]  
*Crystallogobius linearis* (Düben, 1845) [8,31–33]  
*Deltentosteus quadrimaculatus* (Valenciennes, 1837) [29,31–33,58,59]  
*Gobius ater* Bellotti, 1888 [8,31]  
*Gobius cobitis* Pallas, 1814 [29,31–33]  
*Gobius couchi* Miller & El-Tawil, 1974 [106]  
*Gobius cruentatus* Gmelin, 1789 [29,31–33]  
*Gobius fallax* Sarato, 1889 [8]  
*Gobius gasteveni* Iller, 1974 [8]  
*Gobius geniporus* Valenciennes, 1837 [29,31–33,93]  
*Gobius incognitus* Kovačić & Šanda, 2016 [107]  
*Gobius niger* Linnaeus, 1758 [29,31–33]  
*Gobius paganellus* Linnaeus, 1758 [29,31–33]  
*Gobius roulei* de Buen, 1928 [8]  
*Lebetus guilleti* (Le Danois, 1913) [8]  
*Lesueurigobius suerii* (Risso 1820) [32,33,58,59]

Confirmed based on MEDITS [58,59] records since fresh specimens are distinctive.

*Millerigobius microcephalus* (Kolombatovic, 1891) [106]  
*Odondebuenia balearica* (Pellegrin & Fage, 1907) [8,31]  
*Pomatoschistus marmoratus* (Risso, 1810) [31–33,108]  
*Speleogobius llorisi* Kovačić, Ordines & Schliewen, 2016 [8]  
*Thorogobius ephippiatus* (Lowe, 1839) [32,87]  
*Vanneaugobius dollfusi* Brownell, 1978 [8]  
*Zebrus zebrus* (Risso, 1827) [31,106]

### **Order Holocentriformes**

#### **Family Holocentride**

*Holocentrus adscensionis* (Osbeck, 1765) [109]; non-established cryptogenic  
*Sargocentron* sp. (Cuvier, 1829) [31,110]; non-established cryptogenic

Jennings [31] recorded *Sargocentron ruber* [sic!], presumably referring to *Sargocentron rubrum* (Forsskål, 1775), but this was not supported by a photograph or specimen. A substantiated record of an individual belonging to this genus by Deidun et al. [110]

confirms its presence in Maltese waters; however, the exact identity of the species has not been established.

#### **Order Kurtiformes**

##### **Family Apogonidae**

*Apogon imberbis* (Linnaeus, 1758) [29,31–33,58,59]

#### **Order Lampriformes**

##### **Family Lophotidae**

*Lophotus lacepede* Giorna, 1809 [29]

##### **Family Regalecidae**

*Regalecus glesne* Ascanius, 1772 [29,31]

##### **Family Trachipteridae**

*Trachipterus trachipterus* (Gmelin, 1789) [29,31–33]

*Zu cristatus* (Bonelli, 1819) [29,32,33]

#### **Order Lophiiformes**

##### **Family Lophidae**

*Lophius budegassa* Spinola, 1807 [29,31–33,58,59]

*Lophius piscatorius* Linnaeus, 1758 [29,31–33,58,59]

#### **Order Mugiliformes**

##### **Family Mugilidae**

*Chelon labrosus* (Risso, 1827) [29,31–33]

*Liza aurata* (Risso, 1810) [29,31–33]

*Liza ramada* (Risso, 1827) [29,31–33]

*Liza saliens* (Risso, 1810) [29,31–33]

*Mugil cephalus* Linnaeus, 1758 [29,31–33]

*Oedalechilus labeo* (Cuvier, 1829) [29,31–33]

#### **Order Mulliformes**

##### **Family Mullidae**

*Mullus barbatus* Linnaeus, 1758 [29,31–33,58,59]

*Mullus surmuletus* Linnaeus, 1758 [29,31–33,58,59]

*Upeneus pori* Ben-Tuvia & Golani, 1989 [111]: established alien

#### **Order Myctophiformes**

##### **Family Myctophidae**

*Diaphus metopoclampus* (Cocco, 1829) [58,59]

*Diaphus rafinesquii* (Cocco, 1838) [58,59]

*Electrona risso* (Cocco, 1829) [29,31,112]

*Lampanyctus crocodilus* (Risso, 1810) [58,59]

*Lobianchia gemellari* (Cocco, 1838) [58,59]

*Notoscopelus elongatus* (Costa, 1844) [58,59]

#### **Order Notacanthiformes**

##### **Family Notacanthidae**

*Notacanthus bonaparte* Risso, 1840 [58,59]

#### **Order Ophidiiformes**

##### **Family Bythitidae**

*Grammonus ater* (Risso, 1810) [87]

##### **Family Carapidae**

*Carapus acus* (Brünnich, 1768) [29,31–33,58,59]

*Echiodon dentatus* (Cuvier, 1829) [31,58,59]

**Family Ophidiidae**

*Benthocometes robustus* (Goode & Bean, 1886) [58,59]

*Ophidion barbatum* Linnaeus, 1758 [29,31–33,58,59]

*Parophidion vassali* (Risso, 1810) [29,31–33]

**Order Osmeriformes****Family Argentinidae**

*Argentina sphyraena* Linnaeus, 1758 [29,31–33,58,59]

*Glossanodon leioglossus* (Valenciennes, 1848) [58,59]

**Order Ovalentaria (*incertae sedis*)****Family Pomacentridae**

*Abudefduf hoefleri* (Steindachner, 1881) [113]: non-established cryptogenic

*Abudefduf saxatilis* (Linnaeus, 1758) [114,115]: established Atlantic immigrant

*Abudefduf vaigiensis* (Quoy & Gaimard, 1825) [115]: established alien

*Chromis chromis* (Linnaeus, 1758) [29,31–33,58,59]

*Chrysiptera hemicyanea* (Weber, 1913) [116]: non-established alien

*Stegastes variabilis* (Castelnau, 1855) [117]: non-established alien

**Order Perciformes****Family Ammodytidae**

*Gymnammodytes cicerelus* (Rafinesque, 1810) [29,31–33]

**Family Serranidae**

*Anthias anthias* (Linnaeus, 1758) [29,31–33,58,59]

*Cephalopholis hemistiktos* (Rüppell, 1830) [96] (**misidentified**) [118,119]: non-established alien

*Cephalopholis nigri* (Gunther, 1859) [120]: non-established cryptogenic

*Cephalopholis taeniops* (Valenciennes, 1828) [119–121]: established Atlantic immigrant

*Epinephelus aeneus* (Geoffroy Saint-Hilaire, 1817) [29,31–33,58,59]

*Epinephelus caninus* (Valenciennes, 1843) [29,31–33]

*Epinephelus costae* (Steindachner, 1878) [including records of its synonym *Epinephelus alexandrinus* (non Valenciennes, 1828) misapplied] [31,58,59]

*Epinephelus malabaricus* (Bloch & Schneider, 1801) [121]: non-established alien

*Epinephelus marginatus* (Lowe, 1834) [29,31–33,58,59]

*Hyporthodus haifensis* (Ben Tuvia, 1953) [122–124]

*Paranthias cf. furcifer* (Valenciennes, 1828) [125]: non-established alien

*Mycteroperca rubra* (Bloch, 1793) [29,31–33]

*Serranus cabrilla* (Linnaeus, 1758) [29,31–33,58,59]

*Serranus hepatus* (Linnaeus, 1758) [29,31–33,58,59]

*Serranus scriba* (Linnaeus, 1758) [29,31–33]

**Family Stromateidae**

*Stromateus fiatola* Linnaeus, 1758 [29,31–33]

**Family Trachinidae**

*Echiichthys vipera* (Cuvier, 1829) [29,31–33]

*Trachinus araneus* Cuvier, 1829 [29,31–33]

*Trachinus draco* Linnaeus, 1758 [29,31–33,58,59]

*Trachinus radiatus* Cuvier, 1829 [29,31–33,58,59]

**Family Uranoscopidae**

*Uranoscopus scaber* Linnaeus, 1758 [29,31–33,58,59]

**Order Pleuronectiformes****Family Bothidae**

*Arnoglossus rueppellii* (Cocco, 1844) [29,31–33,58,59]

*Arnoglossus imperialis* (Rafinesque, 1810) [29,31–33,58,59]

*Arnoglossus kessleri* Schmidt, 1915 [29,32,33]  
*Arnoglossus laterna* (Walbaum, 1792) [29,31–33,58,59]  
*Arnoglossus thori* Kyle, 1913 [29,31–33,58,59]  
*Bothus podas* (Delaroche, 1809) [29,31–33,58,59]

#### **Family Cithariidae**

*Citharus linguatula* (Linnaeus, 1758) [29,31–33,58,59]

#### **Family Cynoglossidae**

*Symphurus ligulatus* (Cocco, 1844) [58,59]  
*Symphurus nigrescens* (Rafinesque, 1810) [58,59]

#### **Family Scophthalmidae**

*Lepidorhombus boscii* (Risso, 1810) [31,58,59]  
*Lepidorhombus whiffiagonis* (Walbaum, 1792) [31,58,59]  
*Scophthalmus maximus* (Linnaeus, 1758) [29,31–33]  
*Scophthalmus rhombus* (Linnaeus, 1758) [29,31–33]

#### **Family Soleidae**

*Bathysolea profundicola* (Vaillant, 1888) [58,59]  
*Buglossidium luteum* (Risso, 1810) [29,31–33]  
*Dicologlossa cuneata* (Moreau, 1881) [58,59]  
*Microchirus ocellatus* (Linnaeus, 1758) [29,31–33,58,59]  
*Microchirus variegatus* (Donovan, 1808) [29,31–33,58,59]  
*Monochirus hispidus* Rafinesque, 1814 [29,31–33,58,59]  
*Pegusa impar* (Bennett, 1831) [29,32,33]  
*Pegusa lascaris* (Risso, 1810) [31,58,59]  
*Solea solea* (Linnaeus, 1758) [29,31–33,58,59]  
*Synapturichthys kleinii* (Risso, 1827) [29,31–33]

### **Order Scombriformes**

#### **Family Bramidae**

*Brama brama* (Bonaterre, 1788) [29,31–33,58,59]

#### **Family Centrolophidae**

*Centrolophus niger* (Gmelin, 1789) [29,31–33,58,59]  
*Schedophilus ovalis* (Cuvier, 1833) [29,31–33]

#### **Family Gempylidae**

*Ruvettus pretiosus* Cocco, 1833 [29,31–33,77]

#### **Family Nomeidae**

*Cubiceps gracilis* (Lowe, 1843) [58,59]  
*Psenes pellucidus* Lütken, 1880 [103]: non-established Atlantic immigrant

#### **Family Pomatomidae**

*Pomatomus saltatrix* (Linnaeus, 1766) [29,31–33]

#### **Family Scombridae**

*Auxis rochei* (Risso, 1810) [29,31–33]  
*Euthynnus alletteratus* (Rafinesque, 1810) [29,31–33]  
*Katsuwonus pelamis* (Linnaeus, 1758) [29,31–33]  
*Orcynopsis unicolor* (Geoffroy Saint-Hilaire, 1817) [29,31–33]  
*Sarda sarda* (Bloch, 1793) [29,31–33]  
*Scomber colias* Gmelin, 1789 [58,59]  
*Scomber scombrus* Linnaeus, 1758 [29,31–33,58,59] [Additionally, recorded as *Scomber japonicus*; see List 3]  
*Thunnus albacares* (Bonaterre, 1788) [126]: non-established Atlantic immigrant  
*Thunnus alalunga* (Bonaterre, 1788) [29,31–33]  
*Thunnus thynnus* (Linnaeus, 1758) [29,31–33]

#### **Family Trichiuridae**

*Lepidopus caudatus* (Euphrasen, 1788) [58,59]  
*Trichiurus lepturus* Linnaeus, 1758 [29,31–33]

**Order Scorpaeniformes****Family Dactylopteridae**

*Dactylopterus volitans* (Linnaeus, 1758) [29,31–33,58,59]

**Family Peristediidae**

*Peristedion cataphractum* (Linnaeus, 1758) [29,31–33,58,59]

**Family Scorpaenidae**

*Pontinus kuhlii* (Bowdich, 1825) [36]

*Scorpaena elongata* Cadenat, 1943 [31,58,59]

*Scorpaena maderensis* Valenciennes, 1833 [29,31–33,127]

*Scorpaena notata* Rafinesque, 1810 [29,31–33,58,59]

*Scorpaena porcus* Linnaeus, 1758 [29,31–33,58,59]

*Scorpaena scrofa* Linnaeus, 1758 [29,31–33,58,59]

**Family Sebastidae**

*Helicolenus dactylopterus* (Delaroche, 1809) [29,31–33,58,59]

**Family Triglidae**

*Chelidonichthys cuculus* (Linnaeus, 1758) [29,31–33,58,59]

*Chelidonichthys lastoviza* (Bonnaterre, 1788) [29,31–33,58,59]

*Chelidonichthys lucerna* (Linnaeus, 1758) [29,31–33,58,59]

*Chelidonichthys obscurus* (Walbaum, 1792) [29,31–33,58,59]

*Eutrigla gurnardus* (Linnaeus, 1758) [29,31–33,58,59]

*Lepidotrigla cavillone* (Lacepède, 1801) [29,31–33,58,59]

*Lepidotrigla dieuzeidei* Blanc & Hureau, 1973 [58,59]

*Trigla lyra* Linnaeus, 1758 [29,31–33,58,59]

**Order Stomiiformes****Family Sternoptychidae**

*Argyropelecus hemigymnus* Cocco, 1829 [58,59]

**Family Stomiidae**

*Chauliodus sloani* Bloch & Schneider, 1801 [58,59]

*Maurolicus muelleri* (Gmelin, 1789) [31,58,59]

*Stomias boa* (Risso, 1810) [31,58,59]

**Order Syngnathiformes****Family Centriscidae**

*Macroramphosus scolopax* (Linnaeus, 1758) [29,31–33,58,59]

**Family Fistulariidae**

*Fistularia commersonii* Rüppell, 1838 [58,59,128]: established alien

**Family Syngnathidae**

*Hippocampus guttulatus* Cuvier, 1829 [29,31–33]

*Hippocampus hippocampus* (Linnaeus, 1758) [29,31–33]

*Nerophis maculatus* Rafinesque, 1810 [29,31–33]

*Nerophis ophidion* (Linnaeus, 1758) [29,31–33]

*Syngnathus abaster* Risso, 1827 [29,31–33]

*Syngnathus acus* Linnaeus, 1758 [29,31–33,58,59]

*Syngnathus phlegon* Risso, 1827 [29,31–33]

*Syngnathus typhle* Linnaeus, 1758 [29,31–33]

**Order Tetraodontiformes****Family Balistidae**

*Balistes capriscus* Gmelin, 1789 [including records of its synonym *B. carolinensis*] [29,31–33]

**Family Molidae**

*Mola mola* (Linnaeus, 1758) [29,31–33]

*Ranzania laevis* (Pennant, 1776) [29,31–33]

**Family Monacanthidae**

*Stephanolepis diaspros* Fraser-Brunner, 1940 [29,129]: established alien

**Family Tetraodontidae**

*Lagocephalus lagocephalus* (Linnaeus, 1758) [29,31–33]

*Lagocephalus sceleratus* (Gmelin, 1789) [130]; established alien

*Sphoeroides pachygaster* (Müller & Troschel, 1848) [128,131]: established Atlantic immigrant

**Order Zeiformes****Family Zeidae**

*Zeus faber* Linnaeus, 1758 [29,32,33,58,59]

**List A2. Species recorded from Maltese waters whose presence requires confirmation.****Notes**

1. Malta is in the area of occurrence of the species as reported in the Fishbase distribution map; however, none of the records from Malta (GSA15) are supported by an actual specimen, and a detailed morphological examination is needed to confirm species identity.
2. Recorded from MEDITS surveys in neighbouring GSAs 13, 14, 16, 19, or 21 (see April 2019 MEDITS TM list).
3. No records from MEDITS surveys in neighbouring GSAs 13, 14, 16, 19, or 21 (see April 2019 MEDITS TM list).
4. No confirmed record from MEDITS in the Mediterranean Sea.
5. Fishbase lists this species as “questionable” for Malta, giving Whitehead et al. [132] as a reference. Although Whitehead et al. [132] do not specifically mention Malta, and there are no confirmed records from Maltese waters, its occurrence here is considered possible given the records from neighbouring GSAs (Note 2).
6. The only record from Malta is that by Jennings [31]. Although this is considered an unreliable source (see Methods), there are records of this species from neighbouring GSAs (Note 2), so its occurrence in Maltese waters is considered possible.

**Class Elasmobranchii****Order Carcharhiniformes****Family Carcharhinidae**

*Carcharhinus altimus* (Springer, 1950) **Landings data** [60,61] (**Notes 1, 4**)

Reported in Maltese 2018 commercial fishery landings data. Although this could be a misidentification, there are sporadic records from the Mediterranean, including from Italy (Calabria) and Turkey [133], so its occurrence in Maltese waters is possible.

*Carcharhinus brachyurus* (Günther, 1870) [9] (**Notes 1, 4**)

*Carcharhinus brevipinna* (Müller & Henle, 1839) [9,29,32,33] (**Notes 1, 4**)

*Carcharhinus limbatus* (Valenciennes, 1839) [9,29,32,33] (**Notes 1, 4**)

*Carcharhinus plumbeus* (Nardo, 1927) [9,29,32,33] (**Notes 1, 4**)

Members of the genus *Carcharhinus* are very difficult to tell apart due to overlapping characteristics and, therefore, easily confused with one another. The presence of each of these four species, therefore, requires confirmation. According to Schembri et al. [9], *C. brachyurus*, *C. brevipinna*, and *C. plumbeus* are all likely to occasionally occur in Maltese waters, while *C. limbatus* is less likely due to the absence of confirmed records from elsewhere in the Sicilian Channel.

**Family Centrophoridae**

*Centroscymnus coelolepis* Barbosa du Bocage & de Brito Capello, 1864 [31] (**Notes 1, 4**)

Fishbase lists this species as “questionable” for Malta, giving Compagno [134] as a reference even though this author does not specifically mention Malta. A finding of this species from Maltese waters was reported in the local press, but no scientific article has been published. In the absence of authenticated records from Maltese waters, the presence of this species must be considered unconfirmed.

**Order Myliobatiformes****Family Dasyatidae**

*Dasyatis tortonesei* Capape, 1975 [58,59] (Notes 1, 3)

**Class Actinopteri****Subclass Teleostei****Order Acropomatiformes****Family Epigonidae**

*Microichthys coccoi* Rüppell, 1852 [31] (Notes 1, 2, 6)

**Order Alepocephaliformes****Family Alepocephalidae**

*Alepocephalus rostratus* Risso, 1820 [31] (Notes 1, 2, 6)

**Order Anguilliformes****Family Nemichthyidae**

*Nemichthys scolopaceus* Richardson, 1848 [31] (Notes 1, 2, 6)

**Order Atheriniformes****Family Atherinidae**

*Atherina presbyter* (Cuvier, 1829) [31–33] (Notes 1, 4)

**Order Aulopiformes****Family Evermannellidae**

*Evermannella balbo* (Risso, 1820) (Notes 1, 2, 5)

**Order Blenniformes****Family Blennidae**

*Salaria basilisca* (Valenciennes, 1836) [31–33] (Notes 1, 4)

Reported as frequent by Jennings [33] but most probably misidentified for *Lipophrys pavo*.

**Order Carangaria (*incertae sedis*)****Family Sphyraenidae**

*Sphyraena chrysotaenia* Klunzinger, 1884 [29] (Note 3)

In view of the confused taxonomy as discussed by Kiparissis et al. [135], and the new genetic and morphological data provided by these authors, the locally occurring *Sphyraena* previously attributed to *S. chrysotaenia* needs to be re-evaluated morphologically and genetically to establish its exact identity. In addition, *S. chrysotaenia* is considered a junior synonym of *S. pinguis* Günther, 1874 by some authors (e.g., [63]) but retained as a valid species in FishBase [13].

*Sphyraena sphyraena* (Linnaeus, 1758) [29,31–33] (Notes 1, 2)

As indicated in FishBase [13], most published records do not separate this species from *S. viridensis* (Cuvier 1829), and records of *S. sphyraena* from Malta by past authors probably refer to *S. viridensis*. Specimens were not preserved, and no morphometric measurements or meristic counts were taken; thus, the presence of this species in Maltese waters requires confirmation.

**Order Clupeiformes****Family Clupeidae**

*Alosa alosa* (Linnaeus, 1758) (Notes 1, 3)

This species is often confused with *Alosa fallax*, and its presence in Maltese coastal waters, therefore, requires confirmation.

**Order Eupercaria incertae sedis****Family Labridae**

*Ctenolabrus rupestris* (Linnaeus, 1758) [31–33] (Notes 1, 3)

*Labrus mixtus* Linnaeus, 1758 GJ (Notes 1, 2)

**Family Sparidae**

*Dentex maroccanus* Valenciennes, 1830 [31,58,59] (Notes 1, 3)

*Evynnis ehrenbergii* (Valenciennes, 1830) [31–33] (Note 4)

Records from Malta are indicated as ‘questionable’ in Fishbase. Probably the fish referred to as “*Pagrus ehrenbergi* (Valenciennes)” by Farrugia Randon & Sammut [32], and Sammut [33] are actually *Pagrus coeruleostrictus*; Jennings [31] gives “*Pagrus ehrenbergi* V. (syn. *Sparus spinifer* Forskal)” which is confusing since *Sparus spinifer* (now *Argyrops spinifer* (Forsskål, 1775)) is not a synonym of *Evynnis ehrenbergii*.

**Order Gadiiformes****Family Macrouridae**

*Coelorinchus occa* (Goode & Bean, 1885) [58,59] (Notes 1, 3)

*Gaidropsarus biscayensis* (Collett, 1890) [31] (Notes 1, 2)

**Family Trachyrincidae**

*Trachyrincus scabrus* (Rafinesque, 1810) [31] (Notes 1, 2, 6)

**Order Gobiesociformes****Family Gobiesocidae**

*Aphia minuta* (Risso, 1810) [29,31–33] (Notes 1, 2)

Commonly reported in fishery catches (Malta commercial fishery landings data) and, therefore, likely occurs in Maltese waters [8], but records have not been supported by actual specimens or expert identifications, so at present should be regarded as unconfirmed.

*Arctozenus risso* (Bonaparte, 1840) (Notes 1, 2, 5)

*Opeatogenys gracilis* (Canestrini, 1864) [31] (Notes 1, 4, 6)

There are sporadic but widespread records from the Mediterranean, and may, therefore, also occur in Maltese waters.

**Order Gobiiformes****Family Gobiidae**

*Chromogobius quadrivittatus* (Steindachner, 1863) [32] (Notes 1, 2; vide [8])

*Deltentosteus collonianus* (Risso, 1820) [58,59] (Notes 1, 3; vide [8])

*Gobius auratus* Risso, 1810 [31–33] (Notes 1, 2; vide [8])

*Gobius bucchichi* Steindachner, 1870 [29,31–33] (Notes 1, 2; vide [8])

*Lesueurigobius friesii* (Malm, 1874) [58,59] (Notes 1, 2)

*Lesueurigobius sanzi* (de Buen, 1918) [58,59] (Notes 1, 2; vide [8])

*Pomatoschistus minutus* (Pallas, 1770) [29,31–33] (Notes 1, 2; vide [8])

*Pomatoschistus norvegicus* (Collett, 1902) [31] (Notes 4, 6)

Possibly occurs in Maltese waters given there are records from the Tyrrhenian, Adriatic, and Aegean seas.

*Zosterisessor ophiocephalus* (Pallas, 1814) [29,31–33] (Notes 1, 3; vide [8])

**Order Myctophiformes****Family Myctophidae**

*Benthosema glaciale* (Reinhardt, 1837) (Notes 1, 2, 5)

*Ceratoscopelus maderensis* (Lowe, 1839) (Notes 1, 2, 5)

*Diaphus holti* Tåning, 1918 (Notes 1, 2, 5)

*Gonichthys cocco* (Cocco, 1829) (Notes 1, 2, 5)



*Hygophum benoiti* (Cocco, 1838) (Notes 1, 2, 5)  
*Hygophum hygomii* (Lütken, 1892) (Notes 1, 2, 5)  
*Lampanyctus pusillus* (Johnson, 1890) (Notes 1, 2, 5)  
*Lobianchia dofleini* (Zugmayer, 1911) (Notes 1, 2, 5)  
*Myctophum punctatum* Rafinesque, 1810 [58,59] (Notes 1, 2, 5)  
*Symbolophorus veranyi* (Moreau, 1888) (Notes 1, 2, 5)

### Order Ophidiiformes

#### Family Ophidiidae

*Ophidion rochei* Müller, 1845 [29,32,33] (Notes 1, 3)

Lanfranco (1993) [29] states that “further investigation may prove that it may also be present”, but this species was then omitted from Lanfranco (2009) [30].

### Order Perciformes

#### Family Scorpaenidae

*Pterois miles* (Bennett, 1828) [136] (Note 3)

Ulman et al. [136] record *P. miles* from Malta, citing Kletou et al. [137] and Dimitriadis et al. [138], but neither of these papers actually records the species from Malta. The origin of the ‘record’ from Malta appears to be a 2016 press release by the Conservation Biology Research Group at the Department of Biology of the University of Malta that reports the collection of a “lionfish” (without specifying the species) during research by the Group. This press release was carried out by several local newspapers and also in the official University of Malta newsletter ‘Newspoint’. Although the possible occurrence of lionfish in Malta generated a lot of press, no scientific article has yet been published, and the original record has not been supported by any data on the collected fish or a photograph. For these reasons, *Pterois miles* require confirmation.

*Scorpaena loppei* Cadenat, 1943 [58,59] (Notes 1, 2)

### Order Pleuronectiformes

#### Family Pleuronectidae

*Platichthys flesus* (Linnaeus, 1758) [29,31–33] (Notes 1, 3)

Fishbase indicates the record from Malta as ‘questionable’, while Lanfranco (1993) suggests previous records of this species were made outside Maltese waters.

#### Family Soleidae

*Bathysolea profundicola* (Vaillant, 1888) [58,59] (Notes 1, 3)

*Dicologlossa cuneata* (Moreau, 1881) [58,59] (Notes 1, 2)

### Order Stomiformes

#### Family Gonostomatidae

*Gonostoma denudatum* Rafinesque, 1810 (Notes 1, 3, 6)

#### Family Phosichthyidae

*Vinciguerra attenuata* (Cocco, 1838) (Notes 1, 3, 6)

### List A3. Species to be excluded from the checklist of Maltese fish fauna.

#### Notes

1. Malta (GSA15) is in an area of occurrence for the species as reported in the Fishbase distribution map, but in the absence of authenticated records from Maltese waters, this species is excluded from the present checklist.
2. Malta is not in an area of occurrence for the species as reported in the Fishbase distribution map. In the absence of authenticated records from Maltese waters, this species is excluded from the present checklist.

3. Recorded from MEDITS surveys in neighbouring GSAs 13, 14, 16, 19, or 21 (see April 2019 MEDITS TM list).
4. No records from MEDITS surveys in neighbouring GSAs 13, 14, 16, 19, or 21 (see April 2019 MEDITS TM list).
5. No confirmed record from MEDITS in the Mediterranean Sea.
6. Fishbase lists this species as “questionable” for Malta, giving Whitehead et al. [132] as a reference. However, Whitehead et al. [132] do not specifically mention Malta, and there are no records from neighbouring GSAs (Notes 4 or 5). This species is therefore excluded from the present checklist.
7. The only record from Malta is that by Jennings [31], which is considered an unreliable source (see Methods), and there are no records from neighbouring GSAs (Notes 4 or 5). This species is therefore excluded from the present checklist.

### **Class Petromyzonti**

#### **Order Petromyzontiformes**

##### **Family Petromyzontidae**

*Lampetra fluviatilis* (Linnaeus, 1758) [32,33] (Notes 2, 5)

### **Class Elasmobranchii**

#### **Order Carcharhiniformes**

##### **Family Carcharhinidae**

*Carcharhinus melanopterus* (Quoy & Gaimard, 1824) [9,29,32,33] (Notes 2, 5)

This species has been reported as a Lessepsian immigrant in the Mediterranean Sea, but it can be confused with other species of requiem sharks; Serena [139] states that its presence in the Mediterranean is anecdotal, and there are no specimens from this sea.

##### **Family Pentanchidae**

*Galeus atlanticus* (Vaillant, 1888) [58,59] (Note 4)

A single individual of this species was recorded during the 2010 GSA15 MEDITS survey, but the specimen was not preserved, and no morphometric measurements or meristic counts were taken. Since this species has never been previously or subsequently recorded from the central Mediterranean and the only other MEDITS records are from GSA 1 (Northern Alboran Sea) and GSA 2 (Alboran Island), it is likely that the 2010 specimen was misidentified.

##### **Family Sphyrnidae**

*Sphyrna tudes* (Valenciennes, 1822) [9,29,32,33] (Notes 1, 5)

Given the very confused taxonomic history of this species, including the attribution of this name to more than one species (see [134]), the identity of previous records from Malta cannot be ascertained, and this species is therefore excluded from the present checklist.

### **Order Rajiformes**

#### **Family Rajidae**

*Leucoraja naevus* (Müller & Henle, 1841) [9,31–33] (Notes 1, 4)

### **Order Myliobatiformes**

#### **Family Dasyatidae**

*Himantura uarnak* (Gmelin, 1789) Landings data [60,61] (Notes 2, 5)

This Lessepsian immigrant was recorded in Maltese 2019 commercial fishery landings data, but the specimens were not preserved, and no morphometric measurements or meristic counts were taken. Since the current distribution of this species in the Mediterranean appears to be confined to the Levantine Sea, it is likely that the landed specimens were misidentified.

**Class Actinopteri****Subclass Chondrostei****Order Acipenseriformes****Family Acipenseridae**

*Huso huso* (Linnaeus, 1758) [31] (Notes 2, 5, 7)

**Subclass Teleostei****Order Acanthuriformes****Family Pomacanthidae**

*Pomacanthus asfur* (Forsskål, 1775) [140] (Notes 1, 5; vide [141])

**Family Siganidae**

*Siganus rivulatus* Forsskål & Niebuhr, 1775 [29,31–33] (Notes 2, 4; vide [86])

**Order Anguilliformes****Family Ophichthidae**

*Apterichtus anguiformis* (Peters, 1877) (Notes 1, 5, 6)

**Order Atheriniformes****Family Atherinidae**

*Atherinomorus lacunosus* (Forster, 1801) [31] (Notes 2, 5, 7)

**Order Aulopiformes****Family Lestidiidae**

*Lestidiops pseudosphyraenoides* (Ege, 1918) (Notes 1, 5, 6)

**Family Synodontidae**

*Saurida undosquamis* (Ricardson, 1848) [31–33] (Notes 2, 4, 7)

**Order Batrachoidiformes****Family Batrachoididae**

*Halobatrachus didactylus* (Bloch & Schneider, 1801) (Notes 1, 5, 6)

**Order Beloniformes****Family Hemiramphidae**

*Hemiramphus far* (Forsskål, 1775) [31] (Notes 2, 5, 7)

**Order Beryciformes****Family Berycidae**

*Beryx decadactylus* Cuvier, 1829 [31] (Notes 1, 5, 7)

**Family Trachichthyidae**

*Hoplostethus atlanticus* Collett, 1889 [31] (Notes 2, 5, 7)

**Order Blenniiformes****Family Blenniidae**

*Microlipophrys adriaticus* (Steindachner & Kolombatovic, 1883) [31] (Notes 2, 4, 7)

*Microlipophrys canevae* (Vinciguerra, 1880) [31] (Notes 1, 5, 7)

*Lipophrys pholis* (Linnaeus, 1758) [32,33] (Notes 2, 5)

The record from Malta is indicated on Fishbase as a misidentification (see also [29]).

**Order Callionymiformes****Family Callionymidae**

*Callionymus reticulatus* Valenciennes, 1837 [31] (Notes 2, 5, 7)

**Order Carangiformes**

**Family Carangidae**

*Caranx hippos* (Linnaeus, 1766) [31] (Notes 1, 5, 7)

*Seriola carpenteri* (Mather, 1971) [142] (Notes 2, 5)

Malta is in proximity to Italy, where this species occurs as an Atlantic immigrant. A total of 148 specimens of *Seriola carpenteri* were caught 42 nautical miles east of Lampedusa in 1997 [142]. The reproductive conditions of these specimens suggest that this species was established in this area. Given the close proximity of the capture area to the Maltese Islands, this species was included in inventories of newcomer fish in Maltese waters with a 'Questionable' status [38,128]. In the absence of authenticated records from Maltese waters, this species is excluded from the present checklist.

**Family Istiophoridae**

*Istiophorus albicans* (Latreille, 1804) (Notes 1, 5)

Fishbase lists this species as "questionable" for Malta, giving Nakamura [143] as a reference. However, Nakamura [143] does not specifically mention Malta. In the absence of authenticated records from Maltese waters, this species is excluded from the present checklist.

*Kajikia albida* (Poey, 1860) [including its synonym *Tetrapterus albidus* Poey, 1860] [31–33] (Notes 1, 5)

The record from Malta is indicated on Fishbase as a misidentification (see also [29]).

**Order Clupeiformes****Family Clupeidae**

*Clupea harengus* Linnaeus, 1758 Landings data [60,61] (Notes 2, 5)

Recorded in Maltese 2012 and 2016 commercial fishery landings data, but the specimens were not preserved, and no morphometric measurements or meristic counts were taken. Since this species is not known to occur in the Mediterranean Sea, it is likely that the landed specimens were misidentified.

**Family Dussumieriidae**

*Etrumeus golanii* (DiBattista Randall & Bowen, 2012) [144] (Note 4)

This species was recorded off Lampedusa in 2005 [144] (as *Etrumeus teres*) and, given the proximity of the Maltese Islands, it was included in inventories of newcomer fish in Maltese waters with a 'Questionable' status [38,128]. In the absence of authenticated records from Maltese waters, this species is excluded from the present checklist.

**Order Eupercaria (*incertae sedis*)****Family Haemulidae**

*Parapristipoma octolineatum* (Valenciennes, 1833) [58,59] (Notes 1, 4)

A single individual of this species was recorded during the 2013 GSA 15 MEDITS survey, but the specimen was not preserved, and no morphometric measurements or meristic counts were taken. There are no other MEDITS records, and it is likely that the 2013 specimen was misidentified.

**Family Labridae**

*Labrus bergylta* (Ascanius, 1767) [31–33] (Notes 2, 5)

Records from the Mediterranean are questionable, and the record from Malta is indicated in Fishbase as a misidentification (see also [29]).

*Symphodus bailloni* (Valenciennes, 1839) [31] (Notes 1, 5, 7)

**Family Priacanthidae**

*Priacanthus hamrur* (Forsskål, 1775) [31] (Notes 2, 5, 7)

**Order Gadiformes****Family Gadidae**

*Gadus morhua* Linnaeus, 1758 Landings data [60,61] (Notes 2, 5)

Recorded in Maltese 2008 commercial fishery landings data, but the specimens were not preserved, and no morphometric measurements or meristic counts were taken. Since this species is not known to occur in the central Mediterranean Sea, it is likely that the landed specimens were misidentified.

*Merlangius merlangus* (Linnaeus, 1758) [31] (Notes 1, 4, 7)

*Trisopterus luscus* (Linnaeus, 1758) [31] (Notes 1, 4, 7)

#### Family Moridae

*Lepidion lepidion* (Risso, 1810) [31] (Notes 1, 4, 7)

*Physiculus dalwigki* Kaup, 1858 [31] (Notes 1, 4, 7)

#### Order Gobiesociformes

##### Family Gobiesocidae

*Apletodon dentatus* (Facciola, 1887) [31] (Notes 1, 5, 7)

*Gouania willdenowi* (Risso, 1810) [31] (Notes 1, 4, 7)

#### Order Gobiiformes

##### Family Gobiidae

*Buenia jeffreysii* (Günther, 1867) [31] (Notes 2, 5, 7)

*Corcyrogobius liechtensteini* (Kolombatovic, 1891) [31] (Notes 5, 7)

*Didogobius bentuvii* Miller, 1966 [31] (Notes 5, 7)

*Gobius fallax* Sarato, 1889 [31] (Notes 1, 4, 7)

*Gobius scriptus* Fage 1907 [31] (Notes 1, 5, 7)

Recorded by Jennings [31] as its synonym *Gobius schmidti*. This is a doubtful species and probably simply a juvenile form of *Gobius cruentatus* Gmelin, 1789, whose presence in Maltese waters is confirmed (List 1).

*Gobius vittatus* Vinciguerra, 1883 [31] (Notes 1, 4, 7)

*Lebetus scorpioides* (Collett, 1874) [31] (Notes 2, 5, 7)

*Mesogobius batrachocephalus* (Pallas, 1814) [31] (Notes 5, 7)

*Neogobius fluviatilis* (Pallas, 1814) [31] (Notes 5, 7)

*Neogobius melanostomus* (Pallas, 1814) [31] (Notes 2, 5, 7)

*Knipowitschia panizzae* (Verga, 1841) [31] (Notes 5, 7)

*Pomatoschistus flavescens* (Fabricius, 1779) [31] (Notes 5, 7)

*Pomatoschistus lozanoi* (de Buen, 1923) [31] (Notes 2, 5, 7)

*Pomatoschistus microps* (Krøyer, 1838) [33] (Notes 1, 4)

Fishbase indicates that the record from Malta is a misidentification.

*Pomatoschistus quagga* (Heckel, 1837) [31] (Notes 2, 5, 7)

*Pomatoschistus knerii* (Steindachner, 1861) [31] (Notes 2, 5, 7)

*Pomatoschistus pictus* (Malm, 1865) [31] (Notes 2, 5, 7)

*Pomatoschistus tortonesei* Miller, 1969 [31] (Notes 5, 7)

*Pseudaphya ferreri* (de Buen & Fage, 1908) [including its synonym *Pseudaphya pelagica* de Buen, 1931] [31] (Notes 1, 4, 7)

*Thorogobius macrolepis* (Lolombatovic, 1891) [31] (Notes 5, 7)

#### Order Mulliformes

##### Family Mullidae

*Parupeneus barberinus* (Lacepède, 1801) [including its synonym *Pseudopeneus barberinus* (Lacepède, 1801) [29,31–33] (Notes 2, 5; vide [38])

*Upeneus asymmetricus* Lachner, 1954 [31] (Notes 2, 5, 7)

#### Order Perciformes

##### Family Ammodytidae

*Ammodytes tobianus* Linnaeus, 1758 [32,33] (Notes 2, 5)

This species occurs in the Mediterranean, but records of it are from the northern and western areas. According to Lanfranco [29], records of this species from Maltese waters should be attributed to *Gymnamodytes cicereus*.

#### Family Gasterosteidae

*Gasterosteus aculeatus* Linnaeus, 1758 (Notes 1, 5)

Lanfranco (1993) states this species “should not form part of our fauna”. No Sticklebacks are known locally from fresh or brackish waters, and this species is excluded from the present checklist.

#### Family Trachinidae

*Trachinus lineolatus* Fischer, 1885 Landings data [60,61] (Notes 2, 5)

Recorded in Maltese 2018 and 2019 commercial fishery landings data, but the specimens were not preserved, and no morphometric measurements or meristic counts were taken. Since this species is not known to occur in the Mediterranean Sea, it is likely that the landed specimens were misidentified.

### Order Pleuronectiformes

#### Family Psettodidae

*Psettodes belcheri* Bennett, 1831 [29] (Notes 2, 5)

Lanfranco [29] noted this eastern Atlantic species in a local fish market but indicated it was most likely imported by Italian fishers.

#### Family Soleidae

*Pegusa nasuta* (Pallas, 1814) [31] (Notes 5, 7)

### Order Scombriformes

#### Family Centrolophidae

*Schedophilus medusophagus* (Cocco, 1839) [31,145] (Notes 1, 3)

Neither Mifsud [145] nor Jennings [31] provides any evidence that this species occurs in Maltese waters, while Lanfranco [29] explicitly indicates that previous records of this species from Malta were a misidentification of *Schedophilus ovalis*.

#### Family Scombridae

*Auxis thazard* (Lacepède, 1800) Landings data [60,61] (Notes 1, 5)

There are numerous records in Maltese commercial fishery landings data, including for 2015, 2016, and 2018. In the past, *Auxis rochei* and *Auxis thazard* were considered to be the same species, and specimens were often recorded under the name *A. thazard*. Records of *A. thazard* from most Mediterranean countries are considered misidentifications by FishBase and should refer to *A. rochei* instead.

*Scomber japonicus* Houttuyn, 1782 [29,31–33,58,59] (Notes 2, 5)

In the past, *Scomber colias* and *Scomber japonicus* were considered to be the same species, and the Mediterranean *S. colias* was often recorded under the name *S. japonicus*. The most recent genetic analysis based on the entire mitogenome has shown conclusively that *S. colias* and *S. japonicus* are distinct species, and the latter, therefore, does not occur in the Mediterranean [146]. Records from the Mediterranean are, therefore, a misidentification (FishBase).

*Acanthocybium solandri* (Cuvier, 1832) (Notes 1, 5)

Recorded from Malta in Fishbase based on Collette and Nauen [147]. However, Collette and Nauen [147] do not specifically mention Malta. In the absence of authenticated records from Maltese waters, this species is excluded from the present checklist.

#### Family Scopthalmidae

*Zeugopterus regius* (Bonnaterre, 1788) [31] (Notes 1, 4, 7)

#### Family Serranidae

*Epinephelus coioides* (Hamilton, 1822) [148] (Notes 2, 5)

Recorded from Malta by Dragičević et al. [148] based on a photograph of a specimen caught in Maltese waters. In the absence of a specimen, these authors identified the

species based on its livery but then commented that the close similarity in livery between *E. coioides*, *Epinephelus spilotoceps*, and *Cephalopholis niger* [sic!] means that the identification as *E. coioides* is only tentative. In effect, the livery of the specimen matches very well that of *Cephalopholis nigri*, whose presence in Maltese waters had already been confirmed through genetic analysis [120]. Given the questionable taxonomic identification, *Epinephelus coioides* are excluded from the present checklist.

#### Family Tetragonuridae

*Tetragonurus cuvieri* Risso, 1810 [31] (Notes 1, 5, 7)

#### Order Stomiformes

##### Family Gonostomatidae

*Cyclothone pygmaea* Jespersen & Tåning, 1926 (Notes 1, 4, 6)

##### Family Phosichthyidae

*Vinciguerria poweriae* (Cocco, 1838) (Notes 1, 4, 6)

#### Order Syngnathiformes

##### Family Syngnathidae

*Syngnathus taenionotus* Canestrini 1871 [31] (Notes 4, 7)

*Syngnathus tenuirostris* Rathke, 1837 [29,32,33] (Notes 2, 3)

According to Lanfranco [29], reports of this species probably refer to *Syngnathus typhle*. In our view, they are more likely to refer to *Syngnathus acus*. Either way, past records of *S. tenuirostris* from Malta are most likely a misidentification since this species is not known to occur in the central Mediterranean.

#### Order Tetraodontiformes

##### Family Diodontidae

*Diodon hystrix* Linnaeus, 1758 [31] (Notes 2, 5, 7)

##### Family Tetraodontidae

*Arothron hispidus* (Linnaeus, 1758) [31] (Notes 2, 5, 7)

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