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Research Article

Distribution, abundance and colony size of the invasive coral *Oculina patagonica* de Angelis, 1908 (Cnidaria, Scleractinia) in Malta

Martina Cutajar, Julian Evans*, Joseph A. Borg, Hannah Abela and Patrick J. Schembri

Department of Biology, University of Malta, Msida MSD2080, Malta

Author e-mails: *martina.m.cutajar.14@um.edu.mt (MC), julian.evans@um.edu.mt (JE), joseph.a.borg@um.edu.mt (JAB), hannah.abela.16@um.edu.mt (HA), patrick.j.schembri@um.edu.mt (PJS)*

**Corresponding author*

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Abstract

The zooxanthellate, scleractinian coral *Oculina patagonica* is known from various locations in both west and east basins of the Mediterranean Sea, but there are only three casual records of this cryptogenic species from the Central-Ionian area, all from Malta in 2017. Surveys at 28 sites around the Maltese coasts undertaken during the present work revealed 43 colonies spread across ten sites. The coral occurred primarily on artificial substrata in harbour areas at depths shallower than 6 m, but a few colonies occurred on natural rocky bottoms and in non-harbour sites. The largest colonies reached a mean diameter of up to 95 cm and occurred on artificial structures that are only a few decades old, while the majority of the colonies were much smaller (< 40 cm diameter). This, together with the clustering of records in harbour areas, suggests that *O. patagonica* was likely introduced in Maltese waters in recent decades via maritime transport. The present results also confirm that this species is established in the Central Mediterranean area.

Key words: alien species, Central Mediterranean, cryptogenic species, newcomer, non-indigenous species

Introduction

The zooxanthellate, scleractinian coral *Oculina patagonica* de Angelis, 1908, was first recorded from the Mediterranean Sea in 1966, based on a large colony found off Savona Harbour, Italy (Zibrowius 1974). The original description of this species was based on fossil specimens from the south-west Atlantic, and it was therefore deemed to be non-indigenous to the Mediterranean and probably introduced through shipping (Zibrowius 1974). Subsequently, *O. patagonica* was recorded in high abundances from the southeastern coast of Spain, and later, in various countries throughout the Mediterranean basin including Spain, France, Algeria, Tunisia, Croatia, Greece, Turkey, Egypt, Lebanon and Israel (Cvitković et al. 2013; Salomidi et al. 2013; Rubio-Portillo et al. 2014a, and references therein; Terrón-Sigler et al. 2015). However, this species has never been recorded alive outside the Mediterranean, and it has recently been argued that *O. patagonica* may originate from the eastern Atlantic but remained undetected until it began expanding its distribution in the Mediterranean (Leydet and Hellberg 2015). Given the uncertainty around its native or alien status, it is currently considered a cryptogenic species (Serrano et al. 2018).

Live colonies of *O. patagonica* have been reported on both natural and artificial substrata, but in much higher densities and cover on the latter (Salomidi et al. 2013; Serrano et al. 2013, 2018). Most records of this species are from shallow water, with peak abundances within the 2–6 m depth range and rare occurrences below a depth of 10 m (Fine et al. 2001; Coma et al. 2011; Salomidi et al. 2013; Rubio-Portillo et al. 2014a), although a few colonies have been observed at depths down to 28 m (Serrano et al. 2013). The successful, rapid expansion of this species in the Mediterranean in recent years has been attributed to the availability of artificial structures (Salomidi et al. 2013; Serrano et al. 2013, 2018; Rubio-Portillo et al. 2014a), while a phase-shift in dominance from macroalgae to *O. patagonica* on natural substrata has also been reported (Serrano et al. 2012).

Although *O. patagonica* is widespread in the Mediterranean, it has only recently been reported from the Central-Ionian area. In 2017, a report on the occurrence of *O. patagonica* in Maltese waters was carried in local news media based on two colonies discovered by one of us (JE) in Sliema Creek (35.9079°N; 14.5009°N) (*The Sunday Times of Malta*, 12 Nov 2017), but was not published in the scientific literature. A second report from a different locality in Malta (Birzebbuga; 35.8254°N; 14.5342°E) was subsequently made during the same year (Chartosia et al. 2018), suggesting that the species is established in Maltese waters. A third Maltese record, this time from Marsaxlokk (35.8361°N; 14.5479°E), was recently reported in Katsanevakis et al. (2020); this record is dated 19 July 2017 and therefore represents the first finding of this species from the Central Mediterranean. In the present work, we assessed the status of *O. patagonica* along Maltese coasts by mapping its distribution and estimating abundance; we also measured the size of colonies of the coral in an attempt to gain insight into when the species was first introduced.

Materials and methods

Twenty-eight sites along Maltese coasts were surveyed noting the presence or absence of *Oculina patagonica*, for a total coastal length of 7.2 km (see Supplementary material Table S1). At each site, surveys employing SCUBA diving were made along shore-parallel belt transects located at depths of 0 m down to a maximum of 20 m. Transect lengths varied based on the availability of suitable hard substrata, but mostly ranged between 80 m and 500 m. Of the sites studied, 14 where characterised by natural substrata, eight were artificial shorelines, while the rest included a mixture of both natural rocky bottoms and artificial structures.

Colonies of *O. patagonica* were identified based on the following combination of characters, which also enabled distinguishing them from

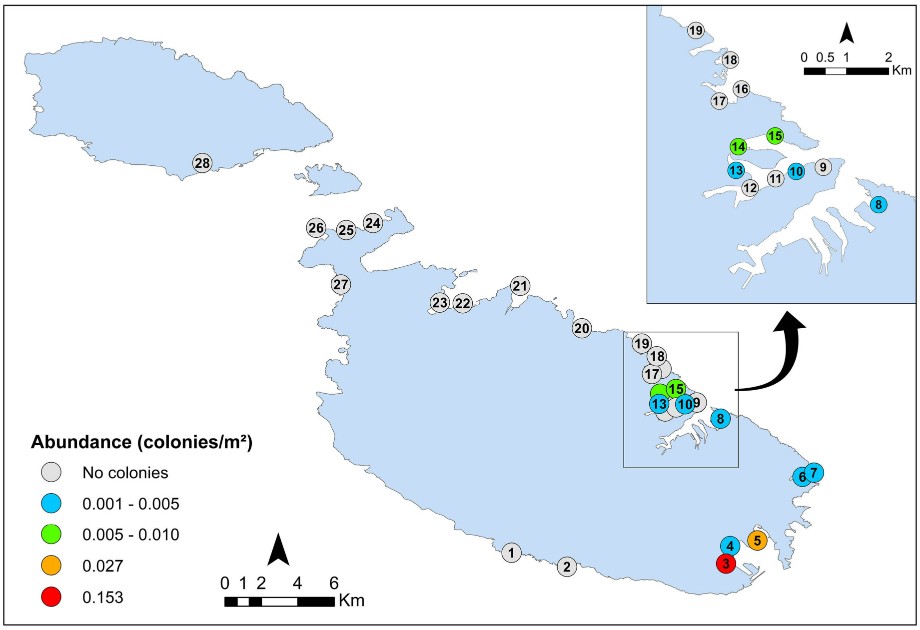

Figure 1. Map showing the Maltese Islands and the abundance of *Oculina patagonica* (colonies/m^2) recorded from the different study sites along the coast; in 2017 *O. patagonica* had been recorded from Sites 4, 5 and 14.

the native colonial scleratinian *Cladocora caespitosa* (Linnaeus, 1767), and from the non-indigenous *Oulastrea crispata* (Lamarck, 1816) that has been recently reported from Corsica and Catalonia (Hoeksema and Ocaña Vicente 2014; Mariani et al. 2018): small polyp calices (< 3 mm diameter); plocoid growth form; calices separated by a wide coenosteum covered by a very evident coenosarc; living tissue light brown in colour; encrusting colonies covering substratum as a thin lamina.

Whenever a colony of *O. patagonica* was found, its location (GPS co-ordinates), depth, and substratum type were recorded. When possible, standardised photographs of the colonies were also taken, together with a scale, enabling the length, width and area covered, and the fraction of the colony having living tissue, to be estimated using the image analysis software ImageJ (Schneider et al. 2012). To quantify the proportion of living tissue, a grid was overlaid on the image and the number of grid cells with visible living tissue was counted; those parts of the colony that either appeared white (i.e. with denuded skeleton) or were overgrown by living algal tissue were considered as dead.

Results

A total of 43 colonies of *Oculina patagonica* were recorded from 10 sites, while no colonies of this species were noted at any of the other 18 sites visited (see Figure 1; Tables S1, S2; the two previously unpublished records made in 2017 from Sliema Creek are included). Only two of the sites hosting *O. patagonica* (Marsascala and Zonqor; Sites 6 and 7 in Figure 1) are located outside harbour environments. The highest abundance was of

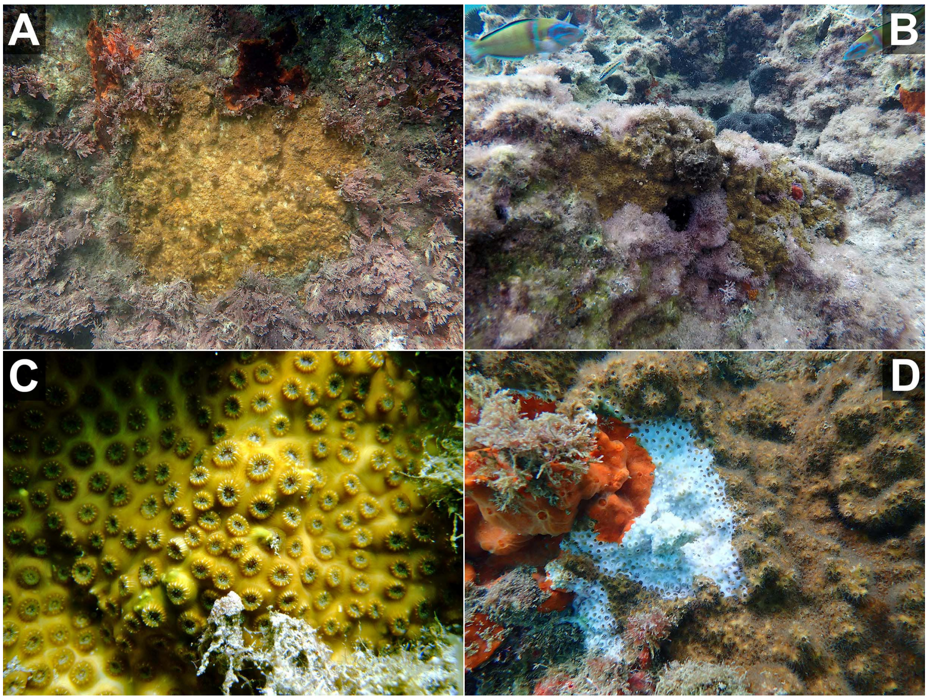

Figure 2. Photographs of some *Oculina patagonica* colonies observed in Maltese waters. A: Colony on artificial substratum; B: Colony on natural substratum; C: Close-up of part of a colony with healthy polyps; D: Close-up of part of a colony with denuded skeleton. Photographs by Julian Evans (A, C, D) and Hannah Abela (B).

12 colonies at Birzebbuga – Pretty Bay (Site 3 in Figure 1), which translates to 0.15 colonies per square metre. The colonies were mostly found on artificial substrata (34 colonies) but were also recorded on a natural substratum (9 colonies), always on vertical or steeply-sloping bottoms. Most occurred at depths between 0.5 m and 2.0 m; the shallowest was found at a depth of 0.1 m, while the deepest record throughout this study was at 6.0 m. Over four-fifths of the colonies appeared to be in good health, with more than 75% of the colony covered by living tissue, while only three colonies were less than 50% alive (see Table S2). In most cases, the dead parts were overgrown by algae; however, bleaching and denuded skeletons were also observed in some instances (Figure 2; see also Table S2).

Discussion

Until recently, the only three records of *Oculina patagonica* in the Central Mediterranean were those from Malta in 2017. The present findings show that this species is in fact well-established in Maltese waters, given the large number of healthy colonies recorded from multiple sites. This study has therefore helped fill in gaps regarding the distribution of *O. patagonica* in the Mediterranean Sea, which confirms that the species is established in the Central Mediterranean. The majority of the colonies recorded from Maltese shores were found on artificial structures such as quays and wharves constructed within the last century. The affinity for artificial habitats is often considered an indication of non-native origin (Chapman and Carlton 1991) and suggests that the Maltese population of *O. patagonica* probably results from a human-mediated introduction. Given that most of the colonies were sited within busy harbours, transport via maritime vessels is the most likely mode of introduction to Maltese waters. Shipping is also thought to be the main introduction pathway in several other Mediterranean countries (Zibrowius 1974; Fine et al. 2001; Sartoretto et al. 2008; Cvitković et al. 2013).

The sizes of colonies found in Malta also suggest a recent introduction of this species within the last few decades. The largest two colonies, which had a mean diameter of 95 cm and 87 cm, occurred in Marsaskala and Sliema Creek (Sites 6 and 14 in Figure 1). Both these colonies were found growing on artificial substrata; attempts were made to ascertain the date of construction of the artificial structures on which they occurred. The Marsaskala "breakwater" surveyed has been in place since 1947 (Marsaskala Local Council, *personal communication*, 25th November 2019) while the structures in Sliema Creek have been re-built several times, with the latest occasion being in the 1980s (Sandro Lanfranco, *personal communication*, 27th November 2019). This suggests that the largest colonies of *O. patagonica* found in Maltese waters cannot be older than around 40–70 years. The majority of the colonies measured in the present work were much smaller (mean diameter < 40 cm) and hence unlikely to be more than two to three decades old, based on published growth rate values (e.g. Fine et al. 2001; Serrano et al. 2017). However, it should be noted that the growth rate of this species is very variable and depends on the season, temperature, light intensity, bleaching events, and also on the size of the colony (since growth rate may change as the colony ages), such that coral size alone cannot be used to accurately calculate the establishment time of a colony (Rubio-Portillo et al. 2014b). In addition, asexual reproduction can produce clones of genetically identical colonies found in close proximity, which can then fuse when in contact, resulting in a single large colony (Sartoretto et al. 2008). Indeed, this could potentially account for the two large colonies recorded from Marsaskala and Sliema Creek.

Although the present results suggest that *O. patagonica* may have been introduced in Malta no more than a few decades ago, it is still somewhat surprising that this conspicuous species remained overlooked until 2017. This may be attributed to several reasons. Firstly, being an encrusting coral, this species cannot be detected by sea users such as fishers; it is only divers and snorkelers who could potentially come across it. Secondly, most of the recorded colonies are sited within busy harbours, which are not popular with recreational SCUBA divers or snorkelers. Only two of the sites hosting this species lie outside harbours, Marsaskala and Zonqor (Sites 6 and 7 in Figure 1), and in both cases the colonies of *O. patagonica* are not in areas commonly frequented by divers or snorkelers. Thirdly, to the untrained eye, this species can be mistaken for the native *C. caespitosa*, especially when small. This combination of factors makes it difficult for this species to be detected and recognised as a new invader by non-scientists. In fact, the three field observations of this species in 2017 were all made by scientists.

The present results, including colonies as large as 0.7 m^2, show that *O. patagonica* is a strong competitor for space with other sessile biota, especially on vertical substrata, as has also been noted elsewhere in the Mediterranean (Zibrowius 1974; Zibrowius and Ramos 1983; Fine and Loya 2003; Sartoretto et al. 2008; Armoza-Zvuloni et al. 2012). This species has been described as an "*opportunistic dominant settler*" that can overgrow other calcareous organisms and eliminate algae and soft faunal species at its growing edge (Sartoretto et al. 2008). It can therefore have an impact on native Maltese benthic communities, particularly if it continues to invade natural rocky bottoms, such as at the two sites Marsaxlokk and Zonqor (Sites 5 and 7 in Figure 1) surveyed in the present study. Most of the sites where *O. patagonica* has been recorded in Malta are also hotspots for the Mediterranean endemic stony coral *C. caespitosa*, an endangered species (Casado de Amezua et al. 2015) that is protected under regional (Annex 2 of the Barcelona Convention) and Maltese legislation. Thus *O. patagonica* can have detrimental effects on *C. caespitosa*, since the latter is the weaker competitor and can be overgrown by the invader (Sartoretto et al. 2008).

The biological features of *O. patagonica* (high growth rate, early reproduction, ability to reproduce both sexually and asexually, wide environmental tolerance and ability to survive low temperatures and in polluted areas), together with an increase in seawater temperature that extends the growing period, and the increased availability of open space provided by artificial habitats, facilitate its proliferation (Fine et al. 2001; Serrano et al. 2013; Salomidi et al. 2013). Conditions in Maltese waters, where the sea temperature ranges 14–28 °C, seem ideal for this species, whose optimal temperature range for growth is 16–26 °C (Rubio-Portillo et al. 2014b; Serrano et al. 2017). Therefore, proliferation may also be expected along Maltese rocky coasts, particularly on artificial substrata in harbour environments, but may also extend to natural rocky bottoms in more pristine sites. Given its potential impact on native communities, monitoring changes in the distribution and abundance of *O. patagonica* is advisable. Furthermore, since the highest abundances at present are found in busy commercial harbours, further spread of this species to other locations within the Central Mediterranean via maritime transport seems inevitable.

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Supplementary material

The following supplementary material is available for this article:

Table S1. Geo-referenced locations of the 28 study sites with details on site type (harbour *vs* non-harbour), substratum type (artificial *vs* natural) and orientation, length / depth / area of surveyed site, and number of colonies and standardised abundance of *Oculina patagonica* recorded from each site.

Table S2. Ecological data (geo-referenced location, depth, substratum type) and status (percentage alive, presence of bleaching or denuded skeleton) for the 43 *Oculina patagonica* colonies recorded from Maltese waters, together with size data (length, width, and mean diameter) where available.

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http://www.reabic.net/journals/bir/2020/Supplements/BIR_2020_Cutajar_etal_SupplementaryMaterial.xlsx

Table S1.

Geo-referenced locations of the 28 study sites with details on site type (harbour vs non-harbour), substratum type (artificial vs natural) and orientation, length / depth / area of surveyed site, and number of colonies and standardised abundance of *Oculina patagonica* recorded from each site

Site name	Site Code	Site number	Latitude	Longitude	Survey dates	Site type	Substratum	Orientation	Surveyed length (m)	Max depth (m)	Surveyed area (m²)	Num. of colonies	Abundance (colonies/m²)
Ghar Lapsi	LPS	1	35.827189	14.424411	Sep 2018	Non-harbour	Natural	Vertical	125	15	1877	0	0.00000
Wied iz-Zurrieq	ZRQ	2	35.820300	14.451800	Sep 2018	Non-harbour	Natural	Vertical	90	20	1792	0	0.00000
Birzebbugia - Pretty Bay	BPB	3	35.821872	14.530329	May 2019	Harbour	Artificial	Vertical	39	2	78	12	0.15330
Birzebbuga - San Gorg	BSG	4	35.830492	14.532381	Sep 2018	Harbour	Artificial	Vertical	79	10	789	3	0.00380
Marsaxlokk	MSX	5	35.833200	14.545808	Sep 2018	Harbour	Natural	Vertical	128	2	256	7	0.02739
Marsaskala	MSK	6	35.864908	14.568111	Oct 2018	Non-harbour	Artificial	Vertical	87	10	868	3	0.00346
Zonqor	ZQR	7	35.866989	14.573808	Aug 2019	Non-harbour	Natural	Vertical	394	8	3148	2	0.00064
Rinella	RNL	8	35.893744	14.527672	Sep 2018	Harbour	Artificial	Vertical	160	8	1283	2	0.00156
Valletta - Il-Fossa	VFS	9	35.901736	14.515875	Mar 2019	Non-harbour	Natural	Vertical	93	5	464	0	0.00000
Valletta - Excelsior	VEX	10	35.900833	14.510112	Apr 2019	Non-harbour	Artificial & Natural	Vertical	296	8	2365	2	0.00085
Valletta - Waterpolo Pitch	VWP	11	35.899289	14.505733	Jan 2019	Non-harbour	Artificial	Vertical	173	8	1384	0	0.00000
Ta' Xbiex	XBX	12	35.897303	14.500294	Aug 2018	Non-harbour	Natural	Vertical	591	9	5319	0	0.00000
Gzira - Lazaretto Creek	GZL	13	35.901058	14.497306	Nov 2019	Harbour	Artificial	Vertical	274	3	823	3	0.00364
Gzira - Sliema Creek	GZS	14	35.906111	14.497778	Sep 2017; Jul 2018; Sep 2018; Nov 2018	Harbour	Artificial	Vertical	196	5	982	8	0.00815
Sliema - Ferries	SLM	15	35.908418	14.505607	Dec 2018	Harbour	Artificial	Vertical	30	5	150	1	0.00667
Sliema - Exiles	EXL	16	35.918411	14.498436	Mar 2019	Non-harbour	Artificial & Natural	Vertical	56	4	225	0	0.00000
Balluta Bay	BLT	17	35.915834	14.493727	Nov 2017; Nov 2018	Non-harbour	Artificial & Natural	Vertical	328	8	2623	0	0.00000
St. Julian's - Il-Qaliet	STJ	18	35.924600	14.496094	Oct 2019	Non-harbour	Natural	Vertical	162	8	1292	0	0.00000
Pembroke	PMB	19	35.930900	14.488739	Jul 2019; Dec 2019	Non-harbour	Natural	Vertical	583	8	4664	0	0.00000
Bahar ic-Caghaq	BHC	20	35.938444	14.459153	Aug 2018	Non-harbour	Natural	Vertical	492	11	5410	0	0.00000
Qawra	QWR	21	35.959481	14.428714	Jul 2019; Sep 2019	Non-harbour	Natural	Vertical	1229	18	22121	0	0.00000
St. Paul's Bay	SPB	22	35.950781	14.400292	Aug 2019; Oct 2019	Non-harbour	Artificial & Natural	Vertical	481	8	3850	0	0.00000
Xemxija - Il-Fekruna	FKR	23	35.951189	14.389019	Oct 2018	Non-harbour	Natural	Vertical	113	10	1126	0	0.00000
Armier	ARM	24	35.990508	14.355983	Jul 2019	Non-harbour	Artificial & Natural	Vertical	210	8	1677	0	0.00000
Marfa	MRF	25	35.987039	14.342739	Aug 2019	Non-harbour	Natural	Vertical	281	8	2248	0	0.00000
Cirkewwa	CRK	26	35.988189	14.327883	Aug 2019	Harbour	Artificial & Natural	Vertical	227	8	1815	0	0.00000
Il-Prajjiet	PRJ	27	35.960144	14.340108	Sep 2018	Non-harbour	Natural	Vertical	83	18	1487	0	0.00000
Mgarr ix-Xini	MGX	28	36.020219	14.271686	Aug 2018	Non-harbour	Natural	Vertical	238	9	2144	0	0.00000

Table S2.

Ecological data (geo-referenced location, depth, substratum type) and status (percentage alive, presence of bleaching or denuded skeleton) for the 43 *Oculina patagonica* colonies recorded from Maltese waters, together with size data (length, width, and mean diameter) where available

Site name	Site number	Colony number	Date recorded	Latitude	Longitude	Substratum	Depth (m)	Proportion alive (%)	Presence of bleaching or denuded skeleton	Length (cm)	Width (cm)	Mean Diameter (cm)
Birzebbugia - Pretty Bay	3	BPB 1	15 May 2019	35.821753	14.530361	Artificial	0.5	100.0	No	N.A.	N.A.	N.A.
Birzebbugia - Pretty Bay	3	BPB 2	15 May 2019	35.821753	14.530361	Artificial	0.5	100.0	No	N.A.	N.A.	N.A.
Birzebbugia - Pretty Bay	3	BPB 3	15 May 2019	35.821753	14.530361	Artificial	0.5	95.0	No	N.A.	N.A.	N.A.
Birzebbugia - Pretty Bay	3	BPB 4	15 May 2019	35.821753	14.530361	Artificial	0.5	80.0	No	N.A.	N.A.	N.A.
Birzebbugia - Pretty Bay	3	BPB 5	15 May 2019	35.821753	14.530361	Artificial	0.5	100.0	No	N.A.	N.A.	N.A.
Birzebbugia - Pretty Bay	3	BPB 6	15 May 2019	35.821753	14.530361	Artificial	0.5	100.0	No	N.A.	N.A.	N.A.
Birzebbugia - Pretty Bay	3	BPB 7	15 May 2019	35.821753	14.530361	Artificial	0.5	100.0	No	N.A.	N.A.	N.A.
Birzebbugia - Pretty Bay	3	BPB 8	15 May 2019	35.821753	14.530361	Artificial	0.5	100.0	No	N.A.	N.A.	N.A.
Birzebbugia - Pretty Bay	3	BPB 9	15 May 2019	35.821753	14.530361	Artificial	0.5	100.0	No	N.A.	N.A.	N.A.
Birzebbugia - Pretty Bay	3	BPB 10	15 May 2019	35.821753	14.530361	Artificial	0.5	100.0	No	N.A.	N.A.	N.A.
Birzebbugia - Pretty Bay	3	BPB 11	15 May 2019	35.821753	14.530361	Artificial	0.5	100.0	No	N.A.	N.A.	N.A.
Birzebbugia - Pretty Bay	3	BPB 12	15 May 2019	35.821753	14.530361	Artificial	0.5	100.0	No	N.A.	N.A.	N.A.
Birzebbuga - San Gorg	4	BSG 1	17 Sep 2018	35.830492	14.532419	Artificial	1.2	66.7	No	6.8	7.3	7.0
Birzebbuga - San Gorg	4	BSG 2	17 Sep 2018	35.830383	14.532447	Artificial	1.5	82.0	Yes	25.3	31.0	28.2
Birzebbuga - San Gorg	4	BSG 3	17 Sep 2018	35.830264	14.532442	Artificial	1.0	80.0	No	15.1	12.8	13.9
Marsaxlokk	5	MSX 1	13 Sep 2018	35.832922	14.546194	Natural	0.2	99.3	No	6.2	6.2	6.2
Marsaxlokk	5	MSX 2	13 Sep 2018	35.832922	14.546194	Natural	0.4	62.1	No	13.7	13.1	13.4
Marsaxlokk	5	MSX 3	13 Sep 2018	35.832922	14.546194	Natural	0.1	100.0	No	1.6	2.2	1.9
Marsaxlokk	5	MSX 4	13 Sep 2018	35.832756	14.546367	Natural	0.3	81.7	No	7.2	8.6	7.9
Marsaxlokk	5	MSX 5	13 Sep 2018	35.832756	14.546367	Natural	0.4	96.8	No	7.8	8.8	8.3
Marsaxlokk	5	MSX 6	13 Sep 2018	35.832700	14.546433	Natural	0.4	25.4	Yes	50.0	60.0	55.0
Marsaxlokk	5	MSX 7	13 Sep 2018	35.832664	14.546461	Natural	0.5	29.1	Yes	50.0	80.0	65.0
Marsaskala	6	MSK 1	01 Oct 2018	35.865128	14.568367	Artificial	6.0	65.2	Yes	21.8	33.6	27.7
Marsaskala	6	MSK 2	01 Oct 2018	35.865069	14.568389	Artificial	2.0	40.4	Yes	90.0	100.0	95.0
Marsaskala	6	MSK 3	01 Oct 2018	35.864969	14.568483	Artificial	2.0	93.0	Yes	30.3	46.6	38.4
Zonqor	7	ZQR 1	31 Aug 2019	35.866867	14.575758	Natural	4.0	91.4	No	N.A.	N.A.	N.A.
Zonqor	7	ZQR 2	31 Aug 2019	35.868431	14.574503	Natural	2.8	100.0	No	N.A.	N.A.	N.A.
Rinella	8	RNL 1	18 Sep 2018	35.893083	14.527114	Artificial	1.0	77.8	Yes	14.8	14.5	14.6
Rinella	8	RNL 2	18 Sep 2018	35.893083	14.527114	Artificial	1.0	52.9	No	14.9	15.9	15.4
Valletta - Excelsior	10	VEX 1	12 Apr 2019	35.898414	14.504675	Artificial	4.0	76.2	Yes	N.A.	N.A.	N.A.
Valletta - Excelsior	10	VEX 2	12 Apr 2019	35.898414	14.504675	Artificial	4.0	67.9	No	N.A.	N.A.	N.A.
Gzira - Lazaretto Creek	13	GZL 1	28 Nov 2019	35.901058	14.497306	Artificial	2.0	99.9	No	N.A.	N.A.	N.A.
Gzira - Lazaretto Creek	13	GZL 2	28 Nov 2019	35.901069	14.497281	Artificial	1.0	97.2	Yes	N.A.	N.A.	N.A.
Gzira - Lazaretto Creek	13	GZL 3	28 Nov 2019	35.902983	14.495742	Artificial	1.0	99.5	No	N.A.	N.A.	N.A.
Gzira - Sliema Creek	14	GZS 1	25 Jul 2018	35.906303	14.497894	Artificial	1.5	75.0	No	15.9	19.6	17.8
Gzira - Sliema Creek	14	GZS 2	30 Jul 2018	35.906700	14.498153	Artificial	1.0	96.9	Yes	21.5	23.7	22.6
Gzira - Sliema Creek	14	GZS 3	30 Jul 2018	35.907161	14.498772	Artificial	0.7	84.7	Yes	20.1	22.5	21.3
Gzira - Sliema Creek	14	GZS 4	29 Nov 2018	35.907850	14.500722	Artificial	1.0	96.8	Yes	29.0	35.7	32.4
Gzira - Sliema Creek	14	GZS 5	29 Nov 2018	35.907869	14.500822	Artificial	2.0	84.2	No	27.2	17.2	22.2
Gzira - Sliema Creek	14	GZS 6	16 Sep 2017	35.907856	14.500953	Artificial	2.0	100.0	No	N.A.	N.A.	N.A.
Gzira - Sliema Creek	14	GZS 7	16 Sep 2017	35.907856	14.500953	Artificial	2.0	99.8	No	N.A.	N.A.	N.A.
Gzira - Sliema Creek	14	GZS 8	14 Sep 2018	35.907856	14.500953	Artificial	2.0	92.3	Yes	95.4	79.7	87.5
Sliema - Ferries	15	SLM 1	26 Dec 2018	35.908278	14.505728	Artificial	0.2	100.0	No	N.A.	N.A.	N.A.