

# Filfla: A Case Study of the Effect of Target Practice on Coastal Landforms

# 21

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## Abstract

Filfla is an islet located in the southernmost point of the Maltese archipelago, at about 5 km southwest of the main island of Malta. The geomorphological features of Filfla, together with the small rocky islet, Filfoletta, located one hundred metres southwest from Filfla, were strongly affected by human impact, as they were used as shooting ranges by military powers until the 1970s. This chapter presents the results of the field survey of the coastal screes surrounding the islet and visual comparisons with local Maltese screes. From these field studies, it was concluded that the consequences of the impact of the bombs still persists. In fact, the cliff surfaces at Filfla are completely bare from vegetation cover and fresh scars were observed. Local fishermen reported that many landslides had occurred during recent years, and they seem to be more frequent than along other Maltese and Gozitan coasts. Moreover, Filfoletta has mostly disappeared after the intense bombing.

## Keywords

Rdum • Coastal geomorphology • Coastal scenery • Landslides • Malta

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## 21.1 Introduction

The recent history of the small island of Filfla (Malta) (Fig. 21.1) provides an interesting case study of military geography, since the island was used intensively until some decades ago as a target for training of gunfire from British vessels (Fig. 21.2). This produced significant impact on the coastal cliffs with respect to natural screes.

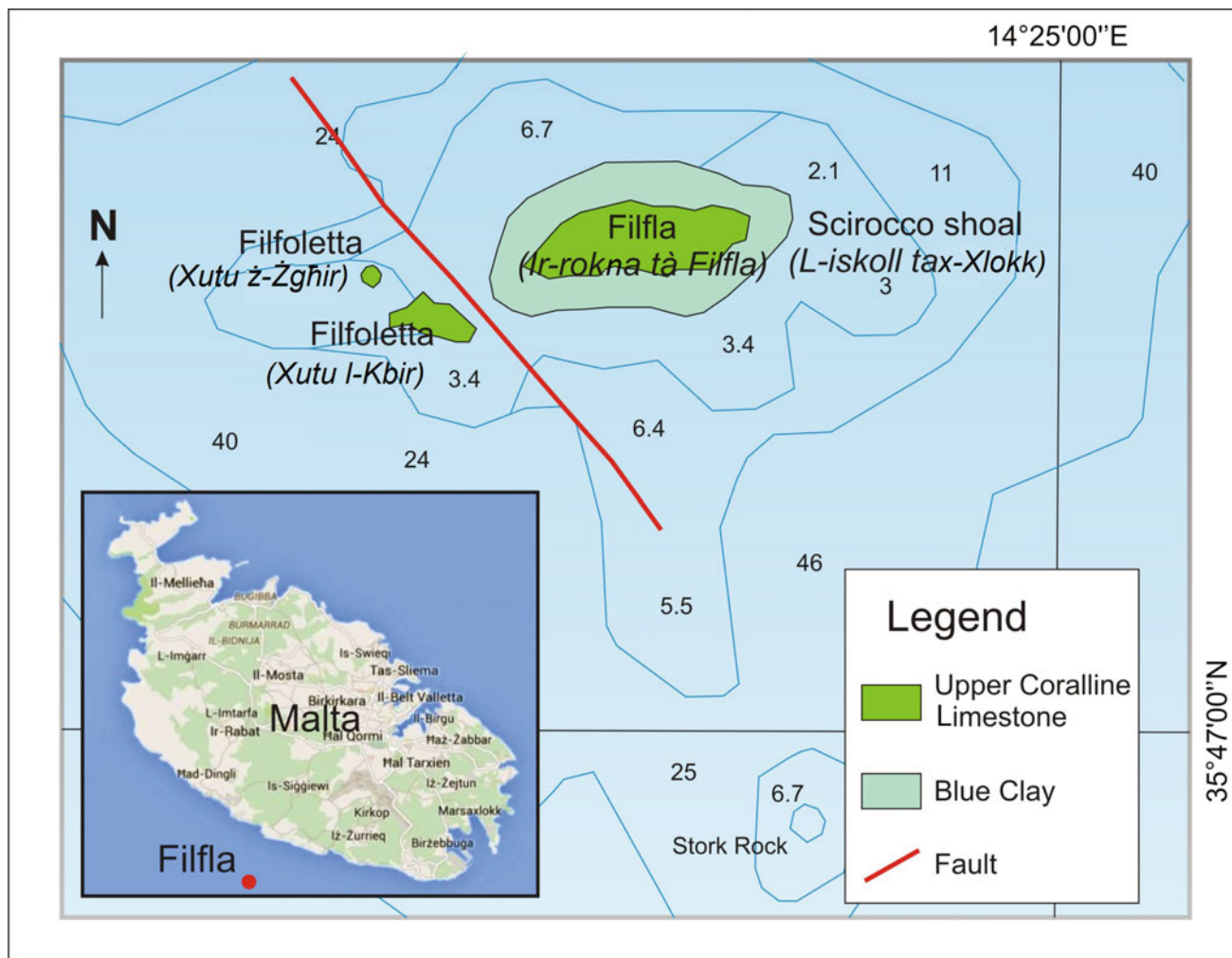
The relations between the impact of warfare and natural environment was studied by several authors (e.g. Bondesan et al. 2012; Certini et al. 2013) and recently reviewed by Francis (2014). These studies are a sub-discipline of military geography (Woodward 2005). Warfare and geography are closely related through the history (Francis 2014), and together they are also called military geography (Woodward 2005). The interest in the conservation of military site is recently increasing (Havlick 2014).

The islet was used for many years as a natural site for target practice by a number of foreign navies, so the natural topography of the coastal cliffs was deeply modified. The islet of Filfoletta was even almost completely destroyed (Fig. 21.1). The landslide activity along the whole perimeter of the islet is strongly conditioned by bombs' impact, and significant differences can be observed when compared to the natural screes on the island of Malta.

We present the results of a geomorphological survey of the islet of Filfla and discuss its recent evolution which marries together natural trends and human impacts, with regard to natural collapses along coastal screes and human impact of bombs on the cliffs.

## 21.2 Geographical Setting

Malta is located in the Sicily Channel, about 200 km south of the convergent segment of the Europe–Africa plate boundary (Fig. 21.1) (Schembri 2019, Chap. 2). The Sicily Channel has been affected during Neogene–Quaternary (Dart et al.



**Fig. 21.1** Geographical and geological sketch of the islet of Filfla. *Source* Geological map redrawn from Oil Exploration Directorate (1993)

1993) by continental rifting, which produced extensive structures, such as the Pantelleria, Malta and Linosa tectonic depressions, controlled by NW-directed sub-vertical normal faults (Galea 2019, Chap. 3). The Maltese graben system is characterised by two intersecting fault trends. To the SW of Malta, the 100-km-wide NW-SE-trending Pantelleria Rift occurs (Dart et al. 1993). It is dissected by two important ENE-WSW-trending grabens: the North Gozo and North Malta Graben (Gauci and Scerri 2019, Chap. 5). They have also been responsible for the major tectonic and geomorphological development of the Maltese Islands. The stratigraphic succession is characterised by shallow marine deposits spanning in time from Upper Oligocene to Upper Miocene (Scerri 2019, Chap. 4). At Filfla, the youngest formation, the Blue Clay and the Upper Coralline Limestone, outcrop.

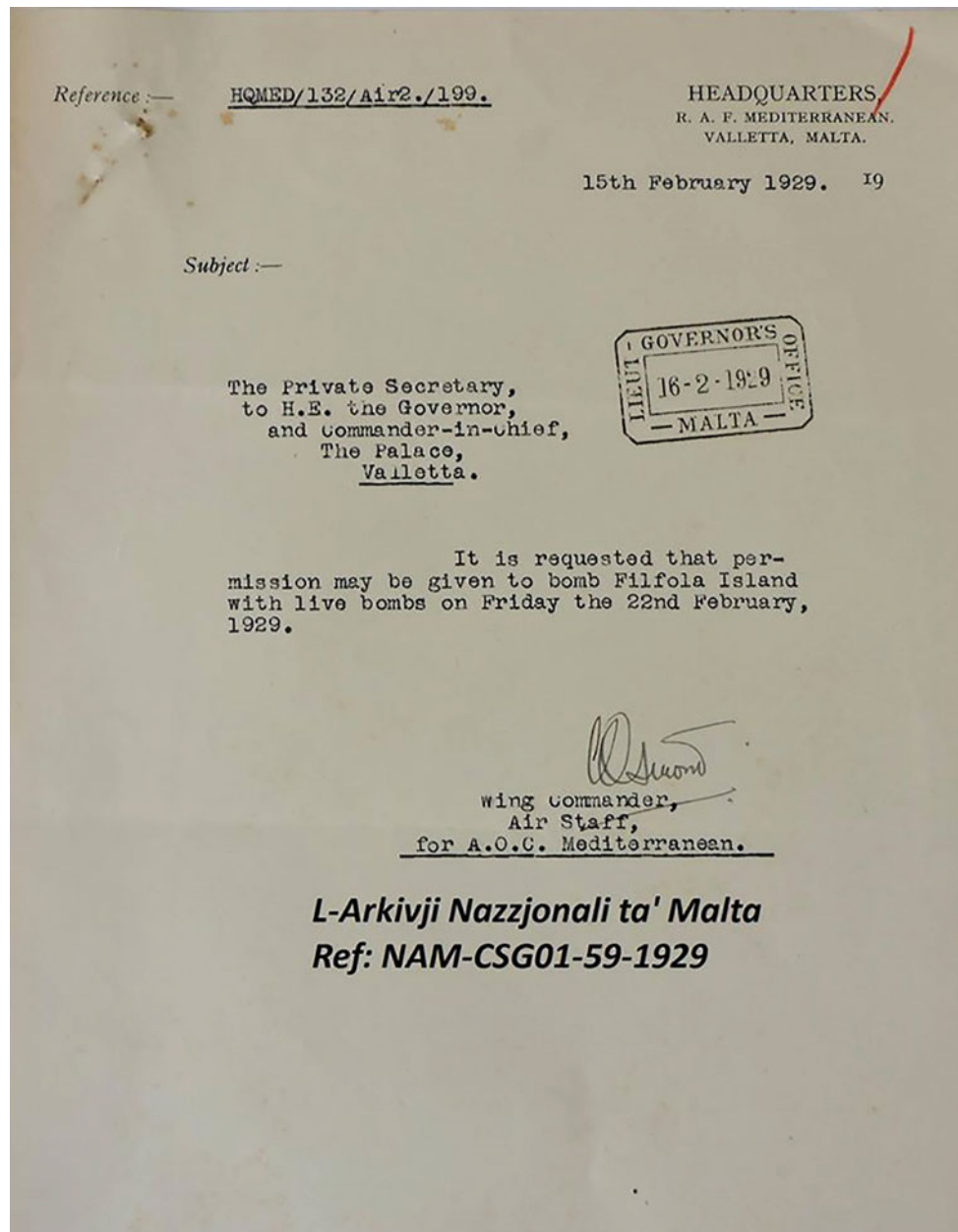
Filfla, the most southerly point of the Maltese archipelago, is a very small and uninhabited islet 5 km south of Malta. Filfoletta, a small rocky islet, lies 100 m southwest of

Filfla (Fig. 21.1). Access to the islet is only possible for educational or scientific purposes, and visitors must get prior permission from the Malta's Environment and Resource Authority (ERA).

Several local names (in Maltese) are given by local fishermen to each part of Filfla, also called 'Ir-Rokna ta' Filfla'. These names cannot be traced on any map of the Maltese Islands but rather form part of a common language shared between fishermen and the locals: 'Il-Prajer' (Upper Xutu); 'It-Tokka' (beyond ix-Xutu); 'il-Qasira' and 'L-Imnizzla' (two shoals); 'In-Nuża' (location where fishing for squids occurs); the aforementioned 'L-Iskoll tax-Xlokk' and 'Is-Sikka tal-Grigal' (meaning the south-eastern shoal and the gregale shoal, respectively); and finally, 'Ix-Xutu l-Kbir' (meaning the big Xutu) and 'Ix-Xutu iż-Żgħir' (meaning the small Xutu).

The islet, 5 km off the southwestern coast of Malta, is the result of the Magħlaq Fault (Gauci and Scerri 2019, Chap. 5). The same fault is also responsible for the plunging cliffs

**Fig. 21.2** A 1929 official request from British Air Staff Commander to the H. E. Governor of Malta to undertake a military target practice on Filfla for the 22nd February 1929. *Source* National Archives of Malta Doc. Ref. No. NAM CSG01-59-1929



from Benghisa up to Fawwara, in Malta. The rifting associated with the NW-SE-trending Pantelleria Rift system which created the Magħlaq faults caused the western side of Malta and Filfla to thrust upwards but also disconnect from each other due to land subsidence (Galea 2019, Chap. 3).

Filfla is composed of Upper Coralline Limestone, capping a layer of Blue Clay (Dart et al. 1993). The consequent morphotype, called scree, was recognised and studied in Malta by several authors (Schembri 2003; Said and Schembri 2010; Dykes 2002; Magri et al. 2008; Devoto et al. 2012; Mantovani et al. 2013; Biolchi et al. 2016; Soldati et al. 2019, Chap. 14). The islet is continuously changing and shrinking through coastal erosion, particularly

because of the presence of active landslides of different type and size. Rock falls and rock topples are dominant and are caused by the presence of a dense network of discontinuities. Most of the surveyed joints were originated by bombs, which hit heavily the islet during the last century (Fig. 21.2).

The climate of the Maltese Islands is typically Mediterranean, characterised by hot, dry long summer and mild and short winters (Grove and Rackham 2001). The average rainfall is 530 mm per year (Schembri 2003), while mean temperatures range from 12 to 27 °C. Due to the position of the Maltese Islands in the mid of the central Mediterranean, they are affected by long fetches mainly in the second and fourth quadrant. Dominant winds come from NW (Galdies 2011).

### 21.3 The Story of Filfla: From Sacred to Military Target

The name Filfla derived from the Arabic word *filfel*, which means chilli, or from Latin *piper*, which means pepper. The name of islet is often attributed to its shape resembling chilli pepper; however, it is also known that the peppergrass (*Lepidium virginicum*) is a very common native plant of Mediterranean coastal regions (Vella 2014).

Temple studies suggest that the islet was considered a mythical sacred place for the Neolithic inhabitants of the temples of Haġar Qim and Mnajdra, which are situated in the vicinity of the Maltese coast opposite Filfla (Grima and Farrugia 2019, Chap. 7). At a time, when temple architects

were high priests and myth-makers, the architecture of these two temples exhibits a strong relationship of veneration with their neighbouring islet. In fact, the axis of both the smaller temple unit of Mnajdra and the extended unit of Haġar Qim is aligned with the islets, positioning the latter as a central backdrop to their altar. Haġar Qim, in particular, was developed from the original traditional three-apsed layout to a seven-apsed model, in which both the altar and the new extended four apses are aligned with Filfla. Pottery sherds and animal bones dating back to the temple period, the Bronze Age, and Copper Age were also found on Filfla, although there is no consensus on whether these remains were evidence or otherwise of some form of permanent settlement of the islet (Farrugia Randon 2006).

**Table 21.1** Filfla chronology: chronological list of main physical, ecclesiastical, political and legal events

Year	Event	Comments
1343	Chapel built inside a cave	Dedicated to the Virgin Mary and also used as a food store for stranded fishermen
1575	Chapel deconsecrated	Liturgical functions discontinued
1561	Knights tried to destroy with gunpowder the only freshwater spring on Filfla	Attempt failed. This was done to deter pirates from landing on Filfla to obtain freshwater in their marauding of Mediterranean coasts. Local fishermen still continued to seek the supply
1813	Plague	Used as a place of shelter
1856	Earthquake	Chapel destroyed and part of island subsided
1927	Burial at sea	Governor of Malta Sir Walter Norris Congreve buried between Filfla and Malta. Channel was then named Congreve Channel
1931	Only water areas are destroyed	Target practice
1940–1943	During World War II (1939–1945) Allied and Axis pilots swam to it	British, German and Italian pilots sought refuge after their planes were shot down
ca eighteenth century - 1971	Target practice by French, British, Italian, Turkish and American ships	Bombing practice increased in the 1950s and 1960s by British and American forces. Unexploded ordnance around island makes fishing hazardous. Military bombings ceased in 1971
1975	Berthing regulations	Government Legal Notice 117 of 1975. Activities prohibited within a radius of one nautical mile (1.9 km)
1982–1985	International Court of Justice Judgment on continental shelf	ICJ decided that Filfla cannot be used in extending the territorial waters of Malta further south in calculating the median line between Malta and Libya
1988	Declared a Nature Reserve	Filfla Nature Reserve Act (Act XV of 1988)
1993	Established as a Bird sanctuary	Government Legal Notice 150 of 1993) included with a list of sites
2002	Malta Environment and Planning Authority scheduled Filfla and Filfoletta as a Level 1 Site of Scientific Importance and a Level 2 Area of Ecological Importance	Government Notice No. 827/02 in the Government Gazette dated 20 September 2002. Act enacted by ACT XV of 1988 entitled Filfla Nature Reserve Act
2015	Discovery of the 1798 Napoleon map of the Maltese Islands	Filfla is depicted in a detailed inset map with a fort, a lighthouse, and a monastery with a chapel built inside a cave
2016	Established as one of the eight Marine Special Protected Areas (SPAs) as part of EU Natura 2000 network	To enhance the conservation of all three protected and declining Malta's seabird species, namely Yelkouan Shearwaters (Garnija), Scopoli's Shearwaters (Ċiefa) and European storm petrels (Kangu ta' Filfla). This is of global importance as the Maltese Islands are home to 10% of Yelkouan Shearwaters' ( <i>Puffinus yelkouan</i> ) global population, 3% of Scopoli's Shearwaters' ( <i>Calonectris diomedea diomedea</i> ) and 50% of the Mediterranean subspecies of European storm petrels ( <i>Hydrobates pelagicus melitensis</i> )

Other historical sources suggest that Filfla may have served other needs prior to those for military target practice during the British period (1800–1964). Amongst these sources, there was the recent rare find of a previously unknown 1798 map of the Maltese Islands (with an inset map of Filfla), currently housed at the Bavarian State Library in Munich (Dalli 2015). The map was engraved by the Probst family in Augsburg (Germany) during the two-year French rule of the Maltese Islands (1798–1800). The inset map of Filfla shows an islet structure complete with a fort, a lighthouse and a monastery with a chapel built inside a cave (Table 21.1).

This map confirms previous sources which described the presence of a small chapel on the islet, dating back to the fourteenth century, and which doubled up as a place of worship and a store for food and water for stranded fishermen during storms (Vella 2014). In 1575, the chapel was deconsecrated (Table 21.1). The last link to the religious past of Filfla is a 1604 painting of a Madonna with St Peter and St Leonard, known as the ‘Madonna ta’ Filfla’ triptych, which is thought to have been in this chapel and now sits in the parish church of the nearby village of Żurrieq (Vella 2014). The chapel was probably destroyed in an earthquake in 1856 (Table 21.1) with all traces inexorably disappearing by military bombings thereafter.

A strong Christian Catholic influence also underlies local folk geomorphology surrounding the creation of Filfla. One of the most popular legends in fact links the creation of the islet to that of another landform: the emblematic sinkhole of Il-Maqluba in Qrendi (Calleja and Tonelli 2019, Chap. 11). Legend narrates how God decided to punish the evil inhabitants of a hamlet—Hal Lew—by crushing the whole village grounds into the abyss and creating a sinkhole as a result. He then dispatched angels to throw the last-remaining village ruins into the sea, creating the islet of Filfla (Gaul 2007). These legends continue to this day to enrich the cultural significance of both landforms and enhance their appeal to tourists (Calleja and Tonelli 2019, Chap. 11).

The islet used to be slightly larger than the present dimensions it displays today (Fig. 21.3). The islet suffered extensive damages following years of being used for gunnery target practice. Filfla and the surrounding islets were used by various military powers as target practice for bombings. Moreover, during the Second World War, German and Italian pilots sought refuge after their planes were shot down by British anti-aircraft. Bombing practice increased in the 1950s and 1960s by British and American forces until the 1970s (Table 21.1). In 1988, the islet was declared a Natural Reserve via the Filfla Nature Reserve Act (Spiteri and Stevens 2019, Chap. 28).

## 21.4 Key Landforms and Landscapes at Filfla

Filfla is a flat-topped limestone plateau surrounded by about 60-m-high vertical cliffs, with collapsed blocks at the cliff foot, forming a scree-slope system locally called ‘rdum’. It has an area of just 0.06 km<sup>2</sup>. In particular, the plateau is about 290 m long and 20 m wide. The circumference at the scarp face is 365 m, while the circumference at the sea level is about 805 m. The maximum height is 62 m above sea level (asl). The island is slightly tilted in an east-west direction. On southern coast, there are some caves at about 15 m asl. The limestone plateau shows spectacular examples of rock falls, accompanied also by rock topples and rock spreads.

The presence of persistent discontinuities and the different properties between the resistant Upper Coralline Limestone and the soft underlying Blue Clay caused the development of the aforementioned landslides, which are witnessed by the presence of large block accumulations located both at sea level and below sea level in the nearshore zones. The Blue Clay stratified outcrop, below the limestone blocks, is sometimes visible along the lower parts of the cliff below the Upper Coralline Limestone.

From a geomorphological point of view, Filfla is similar to Il-Qarraba peninsula (NW Malta) and can be considered a butte, or better a mesa, since its top is wider than its height (Dykes 2002; Soldati et al. 2019, Chap. 14; Zammit Pace et al. 2019, Chap. 18). The hard cap rock resists erosion and provides protection for the underlying less resistant rock from both wind abrasion and wave attack. The plateau surface of Filfla is eroded by abrasion and weathering, and the weathered materials are detached and fall along the talus slope around the base of the mesa.

Beside the natural evolution of the scree, the landform morphology of Filfla landforms is strongly influenced by past target practice which occurred during the previous century, when the Maltese Islands were serving as a British colony and a military outpost for British military operations in the Mediterranean region. Even if military practices ended more than four decades ago, extensive landslides occur along the whole coastline of Filfla because of the geostructural weaknesses produced by explosions. The latter generated vertical joints or enlarged existing discontinuities causing the consequent isolation of large blocks located along the external portions of the mesa. For this reason, landslides affect the whole perimeter of the islet. Most of them are rockfalls and rock topples, while lateral spreading phenomena (Fig. 21.4) occur mainly in the western sector. Unlike other sites in Malta, at Filfla, the sea bottom colour is very clear due to the absence of benthic vegetation due to the fact that blocks and finer debris collapsed down to the sea in recent years.



**Fig. 21.3** Earliest flight images of the islets of Filfla and Filfoletta during the British period: **a** Northern side of Filfla and Filfoletta. **b** Southern side of Filfla and Filfoletta. *Source* Bay Retro

Rainfall infiltration and the presence of seawater accelerate the slope-failure processes. Relatively abundant out-flows were reported in the central/southern sector of the island, where a small valley triggers landslides. Local fishermen continue to observe many slope-failure events in recent years (Pers. Comm.). The westernmost cliff of Filfla (Fig. 21.4) collapsed 8 years ago, while 12 years ago a natural window (Fig. 21.5) collapsed in the same sector (Pers. Comm). Many smaller events are reported along the whole coastline of the island (Fig. 21.4). Two rocks at Filfoletta (Xutu l-Kbir u Xutu ż-Żgħir) suffered considerable damages by bombing, and today they are barely visible above sea level (Fig. 21.5).

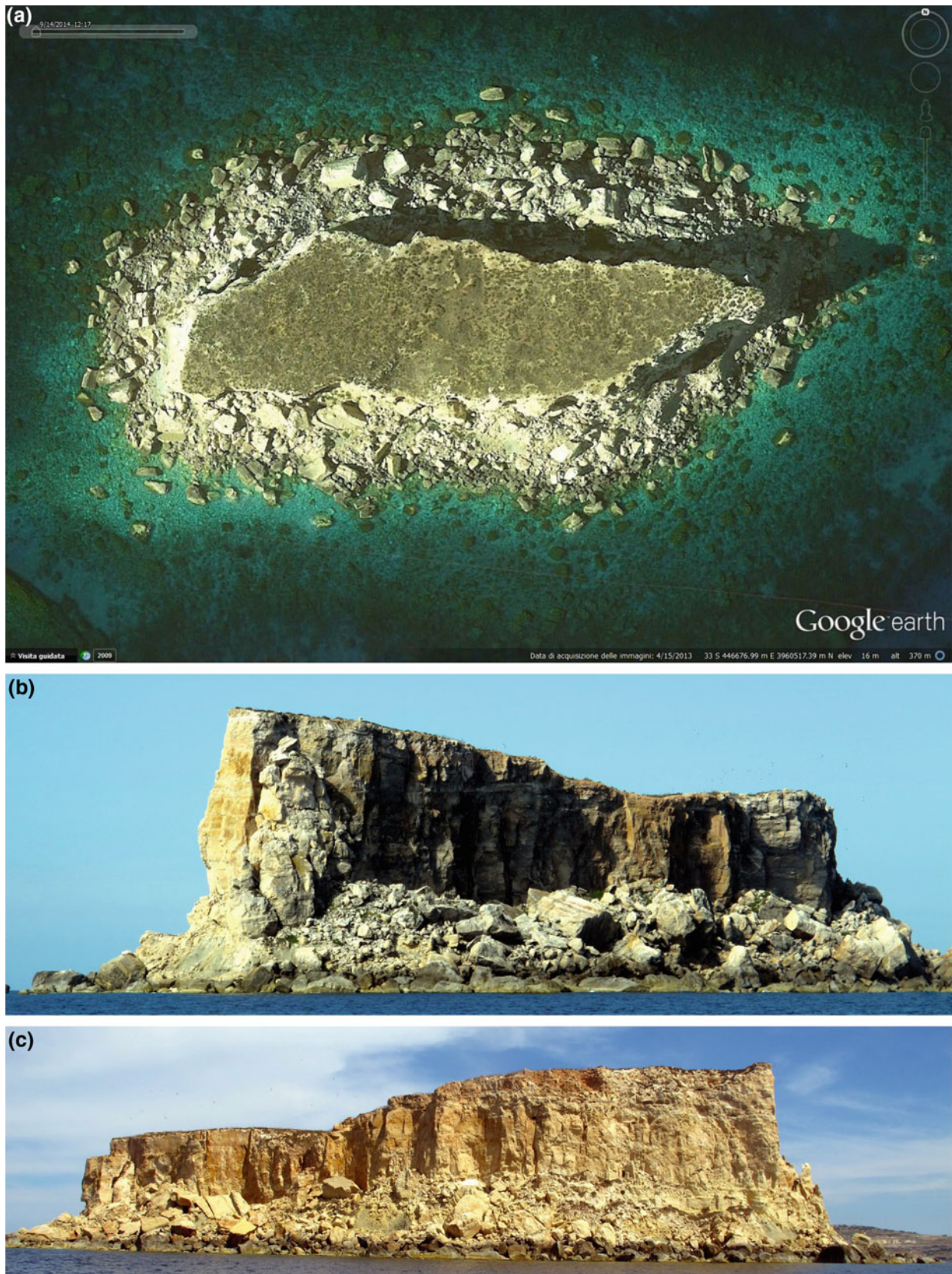
At the easternmost side, there is an underwater rocky shoal, called L-Iskoll tal-Xlokk (Scirocco shoal), that was used as base for a machine gun to target the cliffs and the boulders at Filfla at a closer range.

## 21.5 Ecological Landscapes

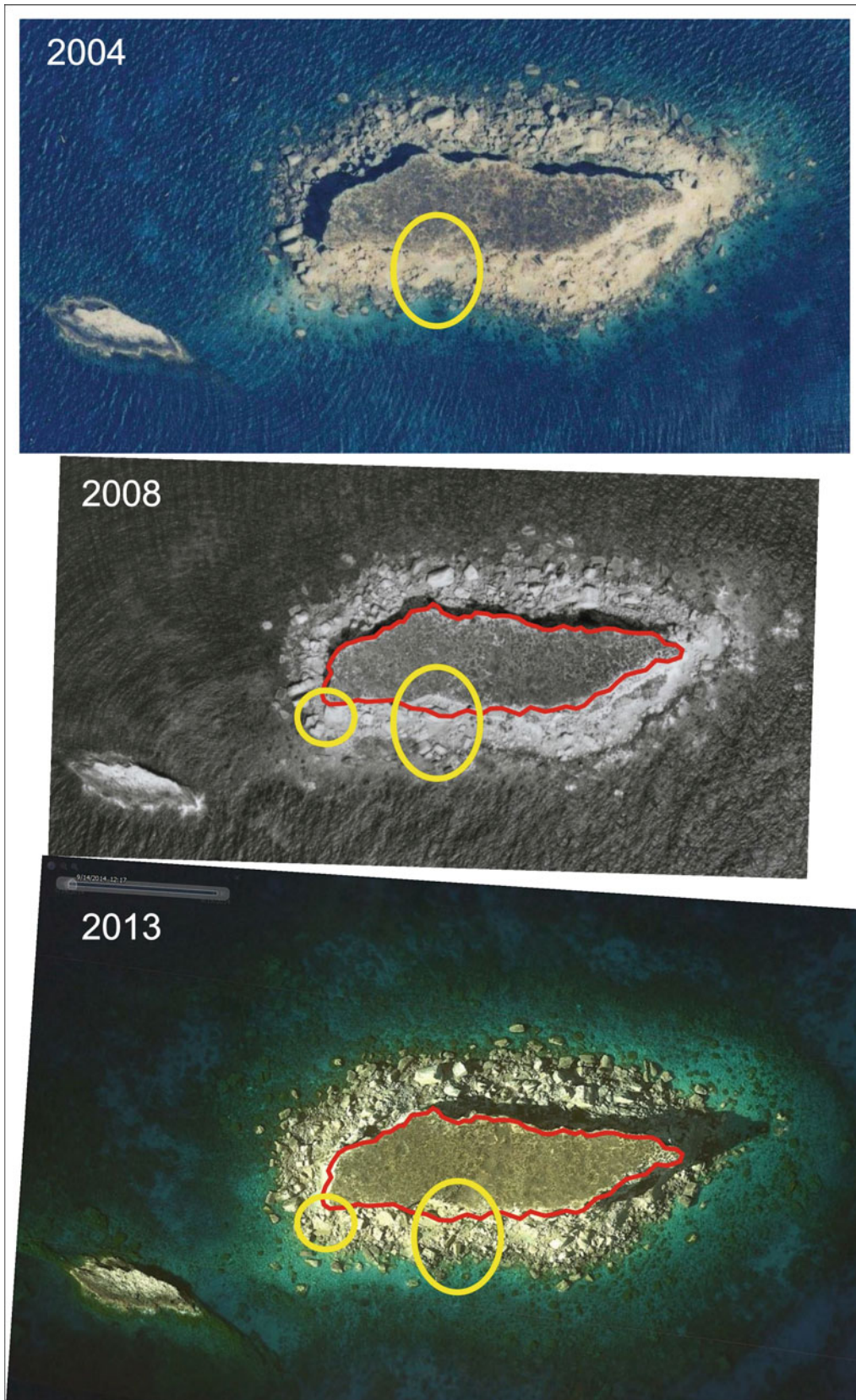
The islet's isolation and difficulty of access have contributed immensely to the survival of a number of endemic, endangered or threatened species of flora and fauna. Filfla Nature Reserve Act (Act XV of 1988) declared Filfla as the first and only nature reserve of the islands at the time. A subsequent

legal notice was introduced in 1993 (LN 150 of 1993) establishing it as a Bird Sanctuary. According to Borg and Sultana (2004), Filfla holds the largest colony in the Mediterranean of the European storm petrel (*Hydrobates pelagicus melitensi*, 5000–8000 individuals) and a colony of Cory's shearwater (*Calonectris diomedea*). Yellow-legged Gulls *Larus cachonnans* nests on top of the island (MEPA 2006). The Yelkouan shearwater (*Puffinus yelkouan*) possibly breeds there. For these reasons (i.e. in view of its important bird-nesting and rafting status), Filfla was included in the list of 11 IBA's (Important Bird Areas) submitted by BirdLife Malta to the EU in 2004. Considering the *Posidonia oceanica* beds, from a survey carried out in 2002, it was discovered that in the Għar Lapsi area, the *Posidonia oceanica* meadow's rhizome primary production values are amongst the higher values for the Mediterranean Sea.

In 2006, an EU-funded marine scientific survey was initiated by Malta Environment and Planning Authority (MEPA), and the survey recorded six main biotopes and 167 species within the 35-m-depth contour. Four of the biotopes were algal dominated, and two were recorded from shaded overhangs and caves. The study concluded that the biotopes recorded were generally rich in species, with fauna and flora to be representative of the Maltese Islands, with similar communities described from elsewhere around the islands. The arches, caves and overhangs support very fragile

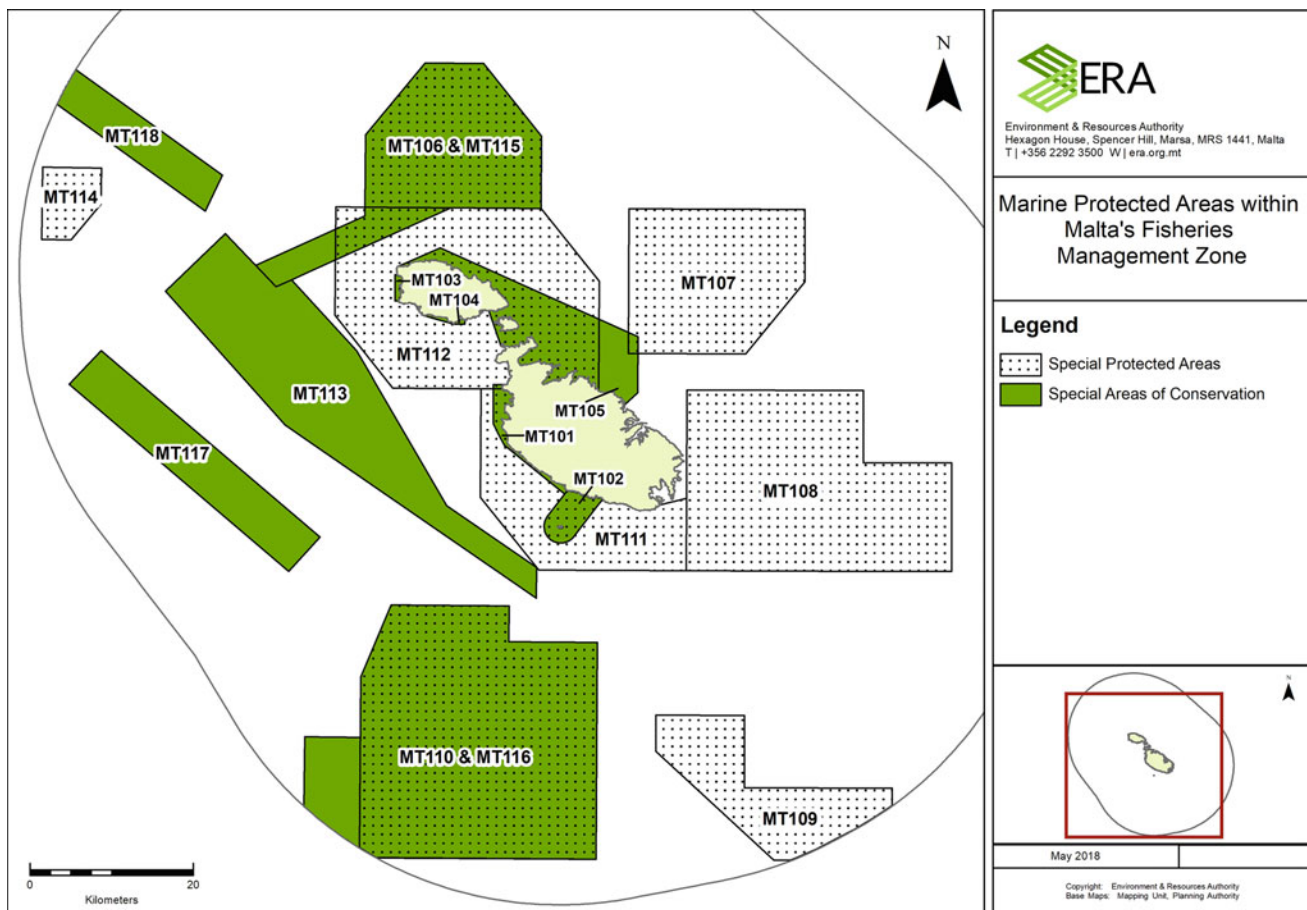


**Fig. 21.4** a Recent aerial image of Filfla. b View of the Northern Side of Filfla. c View of the southern side of Filfla. Source Google Earth Image© Terra Metrics, 2016. Photos S. Furlani



**Fig. 21.5** Most active spots of landslides around the island of Filfla. *Source* Google Earth Image© Terra Metrics, 2004, 2008 and 2013





**Fig. 21.6** Filfla and its surrounding waters established as Special Areas of Conservation MT 102 and Special Protected Area MT 111. *Source* Environment and Resource Authority (2018)

bryozoans and corals (MEPA 2006). Despite the fact that most of the marine species recorded on site are common around the rest of the Maltese Islands, the site's location, the relatively high species richness and the relatively unpolluted waters of the site and its waters justify its present protection status as a Marine Special Conservation Area (SCA) and Special Protected Areas (SPA) under the EU Natura 2000 network (Spiteri and Stevens 2019, Chap. 28).

The site is now designated as a Special Area of Conservation of International Importance via Government Legal Notice 851 of 2010, as declared through the provisions of the Flora, Fauna and Natural Habitats Regulations of 2006 (Legal Notice 311 of 2006) (Fig. 21.6). This marine site is afforded degree of protection also under the Malta Maritime Act (Cap. 352). Government Notice 173 of 1990 (issued under the auspices of Legal Notice 117 of 1975–Berthing Regulations) established an area of one nautical mile radius of no authorised access around Filfla. Unless authorised, no vessel or boat or other craft may be berthed, moored or anchored and no person may swim or carry out any kind of activity connected with underwater

diving or sea sport. This does not apply to activities connected with fishing carried out directly from a vessel, boat or any other craft.

## 21.6 Conclusion

The recent evolution of the islet of Filfla is strongly influenced by a hundred years of target practice. Coastal screes are significantly different from natural and undisturbed context occurring in many sites along the Maltese and Gozitan coasts. Firstly, the vegetation covering the cliffs is completely lacking. Karst forms and features related to differential erosion on the cliffs are less developed compared to Maltese coasts, because of the high number of landslides triggered by the bombs' impact bombs'. Debris from landslides are partly widespread at the cliff foot and partly off-shore, so the seabed close to the island is a very clear blue, due to the recent landslide events.

Filfoletta was almost completely destroyed by bombs, and conservation of the site is called for as high human

impact threatens the island. The declaration of Filfla as a nature reserve and its subsequent scheduling in 2002 as a Level 1 Site of Scientific Importance and a Level 2 Area of Ecological Importance have placed the islets within the areas that protection they clearly needed to ensure their long-term sustainable future.

The marine protected waters surrounding Filfla recently featured in a widely acclaimed documentary by the Malta Airport Foundation in 2015, showcasing an undisturbed marine world that is host to a rich ecological habitat, unexplored limestone landscapes and a submerged war museum.<sup>1</sup> This project, led by PANACEA project crew, Alan Deidun, Pedja Miletic and Shaun Arrigo, provided a significant contribution in bringing a wider recognition of the landscape value of Filfla and its protected waters<sup>2</sup>. It surely serves to re-appraise the touching decision taken in 1927 by General Sir Walter Norris Congreve, Governor of Malta (1924–1927), to be buried in these waters and for whom today the channel bears his name, ‘Congreve Channel’.

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<sup>1</sup>The 30 minutes is available for viewing on [https://youtu.be/isFBQFhfl\\_s](https://youtu.be/isFBQFhfl_s).

<sup>2</sup>PANACEA (Promotion of Marine Protected Areas through Environmental Education Centres) Project is part-financed by the European Union under the Operational Programme I Italia-Malta 2007–2013 to promote marine heritage through ocean literacy initiatives. The Filfla documentary was sponsored by the MIA Foundation, while other documentaries such as those of Rdum Majjiesa (2012), Dwejra (2012), Mġarr ix-Xini (2013) and Comino (2018) were produced within the ambit of the Italia-Malta 2007–2013 PANACEA project.

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