

Potential Ancient Harbours

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Abstract

Over 5000 ancient coastal settlements have been identified so far. It may be accepted that all of them had some kind of boat landing or shelter. From a nautical point of view, many of these sites are not considered very good for sheltering modern yachts, but were nevertheless used in ancient times. Conversely, would you believe that a natural shelter that is considered today as 'excellent' from a nautical point of view would not have been used in ancient times, at least as a bad weather refuge shelter?

If such a place, in addition, provided fresh water and food, it could become more than a simple refuge. If it also had some 'hinterland' providing trade opportunities, it could become a bigger city with sufficient resources to build specific port structures like breakwaters and quays.

The aim of the present study is to list 'Potential Ancient Harbours' defined as natural shelters that are considered 'excellent' by modern sailors but not (yet) listed as ancient harbours. The result is a list of over 200 places that might be further considered by historians and archaeologists to find out if they were indeed ancient settlements.

1. METHODOLOGY

A few authors have been trying to define criteria for the location of ancient ports (Mauro, 2019). Some authors used geographical criteria (headlands, islands, bays, rivers) and other authors more specific criteria (protection from wind and waves, sea bed quality for anchoring, availability of water, salt and food). Nautical aspects were not often taken into consideration (except by Arnaud, 2005) although they are vital for seafarers. The purpose of this paper is to compare shelters considered as 'excellent' by modern yachtsmen with ancient shelters known by archaeology, and to identify locations that might be accepted as 'Potential Ancient Harbours' where archaeologists might have a look around.

a. A Catalogue of ancient harbours

A 'harbour' is a place where ships can seek shelter. The concept of 'shelter' has to include anchorages, landing places on beaches, and ports including structures such as access channels, breakwaters, jetties, landing stages, quays, warehouses for storing of commodities and equipment, shipsheds and slipways. Shelters of interest include all places which may have been used by seafarers sailing over long distances. Villae maritimae are also of interest, but shelters the likes of local fishermen, who may have landed their boats on the beach in front of their homes, are of less interest. In another limitation, only maritime harbours and some river ports that could be reached by deep-sea ships are considered.

This paper presents work done to collect, identify and locate ancient harbours and ports. It is based on a study of existing documentation, i.e. on the writings of nearly 100 ancient authors and over 100 modern authors, incl. the Barrington Atlas.

The ancient authors are usually historians, philosophers or poets, but for this work the geographers retained most of our attention: Agatharchides, Strabo, Pliny the Elder, Ptolemy, Pausanias, Marcian. Some historians also mention many ports: Thucydide, Titus Livius, Plutarch.

In addition to ports mentioned by ancient authors, many ports have been included as mentioned by modern authors: Karl Lehmann-Hartleben (1923), Honor Frost (1963), David Blackman (1982 & 2014), Talbert's Barrington Atlas (2000), Nic Flemming (1986), Getzel Cohen (1995 & 2006), Micha Tiverios (2008), Helen Dawson (2013), Anton Gordieiev (2015) and some up to date web sites (<http://pleiades.stoa.org/> and <http://dare.ht.lu.se/>).

In a first stage, only ports were listed that are explicitly mentioned by each ancient author (portus, navale, statio, places where ships anchored or landed). Cities where the presence of a port was known from other sources were not attributed to an author who mentions the city but does not mention the port. This limitation was certainly questionable as one cannot imagine coastal settlements without at least a minimal shelter for boats. It was therefore decided to include all coastal sites mentioned by the authors of a Periplus who were, or tell about, sailors such as

Odysseus, Hanno, 'Scylax', Pytheas, Jason, 'Stadiasmus', 'Scymnos', 'Erythrean Sea', Arrian and 'Antonine', for whom one might consider that all places they mention are harbours. Furthermore, it was considered that all coastal settlements mentioned in the Barrington Atlas and in DARE must have had a shelter, and they were included too.

A list of over 5000 ancient ports and shelters was elaborated. They are scattered mainly around the Mediterranean Sea, but also in the North Sea, in the Atlantic Ocean, in the Red Sea, in the Gulf and in the Indian Ocean. It can be viewed on: [Catalogue of Ancient Ports](#).

b. A list of modern shelters

Modern yachtsmen use sailing guides, 'Pilots', for each area. These guides provide information on sailing routes, waypoints, services to be found in marinas, etc. They sometimes also rate the quality of the shelter:

- A: excellent,
- B: good with prevailing winds,
- C: reasonable shelter but uncomfortable and sometimes dangerous,
- O: in calm weather only.

Seafarers are intuitive people, they integrate all aspects to provide a judgment on the shelter quality. This judgment is of great value to us here. An excellent A-shelter provides all-round protection from wind, waves and currents, from all directions and at all times. This kind of protection from offshore waves is usually found inside bays with a narrow entrance and complex shape such as a 'dog-leg'. Protection from wind is important also and usually depends on the land topography surrounding the shelter. Note that shelters are defined for modern sailing ships with modern sails and some 'A-shelters' might prove not that good for ancient ships with square sails.

The work sequence was to list A-shelters and to check if each of them was or not recognised as one of the ancient harbours mentioned on the Catalogue of Ancient Ports. Therefore, the 14 modern nautical guides, or 'pilots' listed in the references hereafter have been searched. They contain around 4000 shelters, anchorages, marinas and commercial ports. Around 25% of them are excellent shelters. After comparing each of them with the Catalogue of Ancient Ports, the list hereafter was obtained for shelters that are not yet recognised as ancient harbours, but are good candidates from a nautical point of view.

2. RESULTS

A list of over 200 sites was obtained from the comparison of ancient and modern shelters. It is summarised in the table below, grouping the numbers of Potential Ancient Harbours (PAH) for each area (a complete list is given at the end of this paper).

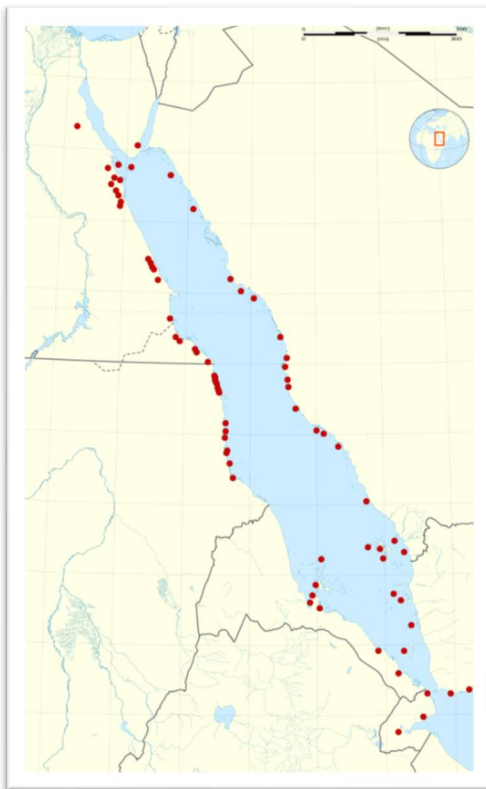
COUNTRY	PAH
Belgium	1
Spain & Portugal	6
Baleares islands	17
France West & South & Corsica	4
Italy, Sicily, Sardinia, other islands and Malta	12
Adriatic Sea	49
Greece & Crete	26
Black Sea	2
Turkey West & South	9
Red Sea & Oman & Somalia	78
Levant, Cyprus & North Africa	2
Total	206

The maps hereafter show that quite a lot of Potential Ancient Harbours are found in Greece, scattered on the mainland and on the islands. Concentrations of Potential Ancient Harbours are found in Croatia, on the Baleares islands and NE Sardinia. The Red Sea provides the largest number of Potential Ancient Harbours, but they are scattered all over the area, with a concentration of 'marsas' in Northern Sudan.



Figure 1. Potential Ancient Harbours in the Mediterranean area.

Figure 4. Potential Ancient



Harbours
in the Red Sea.

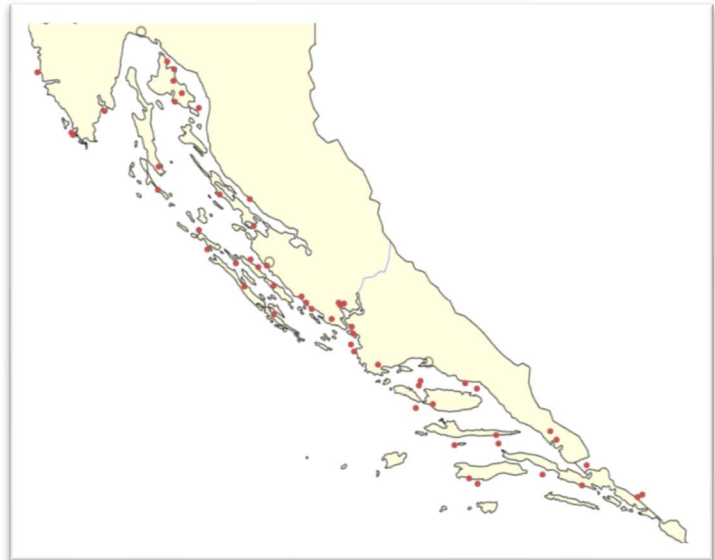


Figure 2. Potential Ancient Harbours in Croatia.



Figure 3. Potential Ancient Harbours
on the Balearic Islands.

The maps shown here have no pretention of accuracy; they just intend to show concentrations of Potential Ancient Harbours; exact locations are available on Google Earth maps shown on: www.AncientPortsAntiques.com

3. SOME ADDITIONAL PORTS ON THE RED SEA

Everybody knows that a coral reef borders the Red Sea on almost its entire length. It is known also that the coral reef hates fresh water, polluted water and sediment and that it therefore is interrupted in places where large 'wadis' have their outlet into the sea. Such discontinuities of the reef provide deep water coves that can be used as shelters for ships. As a matter of fact, water is very deep (over 10 m) and the reef features a kind of vertical underwater cliff. I had an opportunity to swim in such a place in the nineties with my friend Xavier Bohl from Port Grimaud when we were asked to design a marina in a place now called Port Ghalib, and I confirm that it is an impressive swim as one cannot see the seabed although the water is crystal clean. Such a deep water cove is obviously not for anchorage, but the little beach inside the cove is suited for beaching.

The Google Earth view below shows the Marsa Gawasis cove as an interruption of the coral reef, and wadi Gawasis flowing into the sea and wadi Gawasis flowing into the sea.



Wadi Gawasis flowing into the sea at Marsa Gawasis, generating an interruption of the coral reef.



Archaeological remains and location of the ancient port about 300 m from the present coastline. The wadi outlet was filled with sediment provided by the wadi.

The main point here is that:

this interruption of the reef and the resulting cove have been there for 4000 years.

Until recently, I thought wadis were wandering around and present coves were not ancient. However, I changed my mind when looking at Marsa Gawasis where recent archaeological finds

show that this cove was used as a sea port in very ancient times 4000 years ago (Bard & Fattovich, 2007, Tallet, 2015).

Other similar places where this can be seen are Wadi Safaga located 9 km North of Wadi Gawasis, a place possibly called Quei located 26 km South of Wadi Gawasis, Hamrawein port (possibly ancient Arsinoe Troglodytika), Quseir al-Qadim (ancient Myos Hormos), Marsa Dabr, Marsa Nakari (ancient Nechesia?).

This new insight may help to identify other 'potential ancient harbours'. This does of course not mean that an ancient port will be found in each present cove on the Red Sea coast, but it may be worth listing them in order to have a closer look for archaeological remains in these places in the future. Note that many of these coves are used today for holiday resorts and diving centres which may be a sign of good shelter.

Here is the list for the stretch between Hurghada and Ras Banas (400 km). This stretch was chosen because it is the most likely area where ships would stop fighting against the northern wind when returning from their trip to the Indian Ocean, and would unload their precious cargo to continue over land to the Nile river.

List of (30) Additional Potential Ancient Harbours

(Latitudes & longitudes are in decimal degrees, taken from Google Earth)

PLACE NAME*	COUNTRY	LATITUDE	LONGITUDE
Makadi Bay	Egypt	26.99200	33.90500
Al Nabila	Egypt	26.96630	33.92160
Unnamed cove	Egypt	26.94470	33.93370
Unnamed cove	Egypt	26.92910	33.94260
Coral Garden	Egypt	26.57180	34.03200
Kalawy Imperial	Egypt	26.50810	34.06890
Abu Sawatir Rocky Valley	Egypt	26.20550	34.22010
Quseir port	Egypt	26.10000	34.28500
Sharm el Lole, Zerib Kebir	Egypt	26.02300	34.32500
Utopia Beach	Egypt	25.94240	34.39040
Mangrove Bay	Egypt	25.86800	34.41800
Santido Resort	Egypt	25.83930	34.43750
Unnamed cove	Egypt	25.78600	34.48930
Unnamed cove	Egypt	25.72620	34.54690
Unnamed cove	Egypt	25.62070	34.58880
Coraya Bay	Egypt	25.60210	34.60600
Port Ghalib	Egypt	25.53090	34.63400
Three Corners Fayrouz Plaza	Egypt	25.50900	34.65270
Marsa Mooray	Egypt	25.39600	34.70300
Marsa Abu Dabbab	Egypt	25.33900	34.74000
Brayka Bay	Egypt	25.21750	34.80400
Marsa Eglā	Egypt	25.17340	34.84350
Marsa Asalay	Egypt	25.15600	34.85400
Marsa Samadai	Egypt	25.01310	34.92660
Marsa Fokairi	Egypt	24.75550	35.06760
Shams Alam Resort	Egypt	24.69000	35.08700
Unnamed cove	Egypt	24.51950	35.14100
Abu Ghusun	Egypt	24.44900	35.20560
Kala'an Gulf, Wadi Gimal	Egypt	24.36000	35.29800
Lahami Bay	Egypt	24.21230	35.42900

*: place names are taken from Google Earth and may contain some approximations.

4. ANALYSIS

Homeric seafarers often used beaches to land their ships on. It may be noted that a 35 m penteconter with 50 'strong' oarsmen could be hauled on the beach if the slope was mild enough, say no more than 1:10, or 10%, or 6° (the steepest man-made slipways had a slope of 1:6 acc. Blackman, 2013). This requires sand of a certain grain size (Komar, 1998): the very fine sands (or silts) found in large deltas yield a very flat slope which keeps ships far from land. Conversely, a shingle beach has a steep slope that is dangerous for landing ships on. With increasing ship sizes (and weights), beaching became unpractical, if not unfeasible, and places for safe anchorage were sought (see Greg [Votruba, 2017](#)).

During Athenian military expeditions, 200 people had to be fed on board triremes. It was impossible for masters to fill their ships with tons of food. In the absence of ports, ship pilots had to find places with a degree of shelter where drinking water could be found, and river estuaries could provide both. The Stadiasmus is an example of a collection of such knowledge and can be considered as the ancestor of medieval portolans and modern nautical instructions.

Commercial ships also preferred sheltered creeks and river estuaries, possibly with some kind of jetty, as their ships were too heavy to be pulled on the beach.

Seafarers obviously preferred sheltered creeks with clear landmarks on shore (such as a typical mountain). Many shelters were needed, as seafarers often followed the coast, using safe shelters to stop overnight and escape bad weather. Even though they could sail 50 to 100 nautical miles in a day, it was important to know where they could find safe shelter within two to three hours of navigation; i.e. only approx. 10 miles.

Many of these sheltered creeks still exist today, but large changes have occurred in some places:

- crustal movements (e.g. Alexandria, Crete) which explain why some ancient ports are buried under modern ports;
- a eustatic sea level rise of around 0.50 m over the past 2000 years (estimations range from nil to more than 1.50 m, see Nic Flemming, 1986 and Morhange, 2014);
- seismic events inducing tsunamis which devastated adjacent coastal areas (e.g. Crane/Agrostoli);
- river estuaries usually tend to silt up, as rivers carry most of the materials that create beaches, and this explains why some ancient ports are now so far from the sea (e.g. Portus at Fiumicino, Ephesus) or have simply filled up with sand (e.g. Leptis Magna);
- in some large cities the 'old port' has been reclaimed to create a new waterfront area (e.g. Marseille, Beirut);
- beaches are subject to sedimentation and erosion by wave action, and the latter explains why some ancient ports were lost to the sea (e.g. in The Netherlands, Tunisia).

It should be noted also that ancient ports mentioned here have been collected from texts of various dates ranging from 1500 BC (with a few exceptions) to 500 AD (with a few exceptions), that is 2000 years. The various authors have not seen the same things ... and some authors have just repeated what others wrote before them!

5. CONCLUSIONS

The aim of this study is not to provide a comprehensive list of yet unknown Potential Ancient Harbours based on rational and scientific deductions, but rather to list places that might be further investigated by historians and archaeologists. The somewhat intuitive method of comparing a catalogue of recognised ancient coastal settlements with modern pilots listing today's excellent shelters does not give any proof, but just an indication of Potential Ancient Harbours.

Some areas show few Potential Ancient Harbours and this may be due to:

- ancient authors providing a comprehensive description of the coast (e.g. Arrian in the Black Sea);
- comprehensive modern archaeological surveys (e.g. in France, Italy, Spain, Tunisia); hence, many of today's excellent shelters are recognised ancient harbours;
- many of today's excellent shelters are modern marinas just added to a coastline without

any good natural shelter and do not qualify as Potential Ancient Harbours (e.g. in France, Italy, Spain);

- some nautical guides did not survey the smaller anchorages (e.g. North Africa).

Without insult to the modern authors of the nautical guides, it can be said that the ancient *Stadiasmus* includes more places than the modern pilot of the North African coast between Carthage and Alexandria! The same holds for Arrian's *periplus* of the Black Sea.

Conversely, some areas show many potential ancient harbours. This is probably due to a reversed combination of the above factors, e.g. in the Red Sea, Croatia where ancient sources are inaccurate, if any, and modern pilots are quite detailed.

The *Catalogue of Ancient Ports & Harbours* tries to be exhaustive, but is most probably not. Hence, some Potential Ancient Harbours listed here may be recognised by some expert as ancient harbours already known to him and the present author will be delighted to hear about that in order to remove such places from the list of 'potential' ancient harbours. However, large parts of the listed Potential Ancient Harbours are probably real newcomers and will definitely require more attention from historians and archaeologists to find out if they were indeed ancient settlements.

Some of these places may not show a single sign of ancient presence at the anchorage or on land because erosion may have taken away all remains; they will therefore remain 'potential' ancient harbours. Hopefully, other places will provide more evidence of ancient human presence (amphorae, stone anchors, ballast stones, etc.) even if this evidence may be difficult to find as it may be under water and buried under thick layers of sediment.

Even more optimistic, the list of Potential Ancient Harbours might help historians re-interpreting ancient 'Periploi' and Ptolemy's places on the Red Sea ...

List of Potential Ancient Harbours
(Latitudes & longitudes are in decimal degrees, taken from Google Earth)

PLACE NAME	COUNTRY	LATITUDE	LONGITUDE
Nieuwpoort	Belgium	51.137000	2.749000
Camarinas	Spain North	43.132356	-9.172238
Isla Toxa Grande	Spain North	42.487487	-8.844113
Ensenada de San Simon	Spain North	42.303984	-8.63775
Isla Cristina	Spain South	37.206216	-7.327774
El Rompido	Spain South	37.214239	-7.125718
Sancti-Petri	Spain South	36.397146	-6.206802
Las Illetas	Spain Mallorca	39.531926	2.587282
Puerto de Soller	Spain Mallorca	39.796642	2.693481
Porto Cristo	Spain Mallorca	39.54052	3.336989
Porto Colom	Spain Mallorca	39.419308	3.265063
Puerto de Cala Llonga, Cala d'Or	Spain Mallorca	39.369239	3.224449
Porto Petro	Spain Mallorca	39.356874	3.212041
Puerto de Cabrera	Spain Cabrera	39.148226	2.933627
Cala Pi	Spain Mallorca	39.362034	2.83432
Puerto de Fornells	Spain Minorca	40.046405	4.130221
Puerto de Cala de Addaya	Spain Minorca	40.004438	4.199634
Cala Grao, Colom island	Spain Minorca	39.953126	4.273486
Cala Alcaufa	Spain Minorca	39.828192	4.294459
Cala Badella	Spain Ibiza	38.913538	1.222857
Port del Torrent	Spain Ibiza	38.967198	1.267691
Puerto de San Miguel	Spain Ibiza	39.084369	1.437616
Cala Portinatx	Spain Ibiza	39.114326	1.518128
Puerto de Sabina, Estanque Peix	Spain Formentera	38.730422	1.41405
Sausset les Pins	France South	43.330747	5.107255
Port St Pierre on Iles des Embiez	France South	43.079451	5.781492
Baie du Lazaret	France South	43.08292	5.905755
Porto	France Corsica	42.266501	8.693291
Stintino	Italy Sardinia	40.938117	8.225224
Cala Gavetta, on Isla La Maddalena	Italy Sardinia	41.212045	9.404022
Cala Bitta	Italy Sardinia	41.125616	9.470911
Poltu Quatu	Italy Sardinia	41.13583	9.495848
Porto Vecchio of Porto Cervo	Italy Sardinia	41.133359	9.53626
Bay of Cugnana-Portisco	Italy Sardinia	41.016495	9.523114
Porto Rotondo	Italy Sardinia	41.029277	9.546367
Edilnautica marina, on the isle of Elba	Italy West	42.80632	10.314434
Mellieha bay	Malta	35.974829	14.364465
Saint George's bay	Malta	35.926135	14.488961
Marsamxett, Msida creek	Malta	35.896406	14.494795
Blue Lagoon, on the isle of Comino	Malta	36.012741	14.323565
Uvala Tunarica, in Zaljev Rasa	Croatia	44.971613	14.097678
Kraljevica	Croatia	45.272957	14.566458
Jadranovo, in Uvala Percin	Croatia	45.225854	14.614357
Zaton Soline, on the isle of Krk	Croatia	45.15599	14.608581
Vrbnik, on the isle of Krk	Croatia	45.078	14.672386
Mala Luka, on the isle of Krk	Croatia	44.990571	14.80013

Puntarska Draga, on the isle of Krk	Croatia	45.029639	14.619498
Punta Kriza, in Uvala UI, on the isle of Cres	Croatia	44.641311	14.503273
Luka Krivica, on the isle of Losinj	Croatia	44.500672	14.495218
Simuni, on the isle of Pag	Croatia	44.469908	14.955109
Uvala Lukovo-Sugarje	Croatia	44.443888	15.18564
Uvala Jasenova	Croatia	44.282389	15.210407
Prolaz Zapuntel, on Molat island	Croatia	44.259644	14.79917
Uvala Soline, in Luka Soliscica on Dugi island	Croatia	44.141501	14.866483
Preko, on Ugljan island	Croatia	44.082639	15.188513
Kukljica, on Ugljan island	Croatia	44.033868	15.24751
Uvala Soline, on Iz island	Croatia	44.059953	15.076808
LukaTelascica, on Dugi island	Croatia	43.91781	15.142861
Uvala Soline, on Pasman island	Croatia	43.924342	15.360994
Uvala Lavsa, on Lavsa island	Croatia	43.75193	15.365405
Uvala Vela Luka	Croatia	43.860591	15.572466
Betina, on Murter island	Croatia	43.821538	15.60459
Jezera, on Murter island	Croatia	43.784346	15.64349
Rasline	Croatia	43.80763	15.857736
R Guduca	Croatia	43.823954	15.846667
Uvala Beretusa	Croatia	43.818403	15.886719
Prvic Luka, on the isle of Prvic	Croatia	43.723682	15.797362
Jadrtovac	Croatia	43.675937	15.945718
Banovci, in Luka Grebastica	Croatia	43.636672	15.957561
Kremik Marina	Croatia	43.569867	15.940943
Rogoznica	Croatia	43.530629	15.964579
Luka Drvenik, on the isle of Drvenik Veli	Croatia	43.450196	16.144206
Uvala Luka, on the isle of Braç	Croatia	43.33928	16.797672
Uvala Rasotica, on the isle of Braç	Croatia	43.307747	16.885881
Milna, on the isle of Braç	Croatia	43.326169	16.447885
Bobovisce, on the isle of Braç	Croatia	43.352859	16.461513
Uvala Vira, on the isle of Hvar	Croatia	43.190299	16.427861
Luka Tiha, on the isle of Hvar	Croatia	43.214574	16.553908
Ploce	Croatia	43.051272	17.432728
Blace	Croatia	43.001627	17.481396
Mali Ston	Croatia	42.847606	17.704852
Uvala Luka	Croatia	43.029569	17.027106
Vela Luka, on the isle of Korcula	Croatia	42.966498	16.71424
Uvala Kneza, on the isle of Korcula	Croatia	42.975959	17.043988
Skrivena Luka, on the isle of Lastovo	Croatia	42.734814	16.887478
Pasadur, in Luka Velji Lago, on the isle of Lastovo	Croatia	42.767664	16.824639
Okuklje, on the isle of Mljet	Croatia	42.726214	17.670375
Rijeka Dubrovacka	Croatia	42.670778	18.121156
Gruz	Croatia	42.653862	18.086801
Bigova	Montenegro	42.354278	18.704058
Paganian	GR: North-West	39.659491	20.098357
Vathi Vali	GR: North-West	38.758364	20.780577
Varko	GR: North-West	38.764219	20.805779
Nisis Trizonia	GR: North-West	38.368055	22.075595
Boufalo, Voufalo	GR: Evia	38.301918	24.11946

Ormos Vathikelon	GR: Evia	38.9409	22.940174
Ormos Mesopanayia	GR: North-East	40.202842	23.780868
Ormos Kriftos	GR: North-East	40.22181	23.782357
Ormos Dhimitriaki	GR: North-East	40.226768	23.75319
Ormos Panayia	GR: North-East	40.232231	23.737014
Baltiza bay, Spetsai	GR: Peloponnese	37.260157	23.166187
Khaidhari	GR: Peloponnese	37.533736	22.921406
Limin Gouvion, on Corfu	GR: Ionian Isl.	39.65411	19.84904
Palaiokastritsa, Limin Alipa, on Corfu	GR: Ionian Isl.	39.673427	19.709291
Gaios, on the isle of Paxos	GR: Ionian Isl.	39.201797	20.187488
Mongonisi, on the isle of Paxos	GR: Ionian Isl.	39.181934	20.203727
Sivota, on the isle of Lefkada	GR: Ionian Isl.	38.622712	20.683317
Ormos Abelike, on the isle of Meganisi	GR: Ionian Isl.	38.665943	20.790318
Ormos Ay Ioannou, inside Ormos Naousis on Paros	GR: Cyclades Isl.	37.143886	25.227756
Ormos Langeri, inside Ormos Naousis on Paros	GR: Cyclades Isl.	37.138657	25.266262
Vathi, on the isle of Astypalaia	GR: Cyclades Isl.	36.618285	26.395346
Ormos Moudhrou, on the isle of Lemnos	GR: Eastern Isl.	39.87049	25.245694
Koukounaries, on the isle of Skiathos	GR: Eastern Isl.	39.15056	23.399511
Ormos Vasiliko, on the isle of Peristeri	GR: Eastern Isl.	39.200275	23.977237
Planitis, on the isle of Pelagos	GR: Eastern Isl.	39.34733	24.071967
Soudha	GR: Crete North	35.497358	24.079312
Yakakent Liman	TR: Black Sea	41.638876	35.501672
Hamsilos	TR: Black Sea	42.060269	35.04221
Dalyanköy	TR: West	38.353285	26.312599
Gökkovar Limani, Kokar	TR: West	38.137537	26.607011
Küyüçak	TR: West	37.15357	27.559237
Okluk Koyu, inside Degirmen Bükü	TR: West	36.920552	28.171595
Ingilizi Limani, inside Degirmen Bükü	TR: West	36.92347	28.156911
Büyük Cati	TR: West	36.790077	28.012561
Aksaz, in Karaagaç Limani	TR: South	36.840444	28.391038
Kapi Creek	TR: South	36.6432	28.8936
Pölemos Bükü	TR: South	36.164906	29.802672
Mersa Thelemet	Egypt: Red Sea	29.05451	32.635191
Merset el-Qad Yahya	Egypt: Red Sea	27.929551	33.893634
Marsa Zeitiya	Egypt: Red Sea	27.834312	33.583485
Hurghada	Egypt: Red Sea	27.180781	33.83795
Marsa Abu Makhadiq	Egypt: Red Sea	27.041819	33.893311
Ras Abu Soma	Egypt: Red Sea	26.845446	33.978515
Mina Safaga	Egypt: Red Sea	26.740028	33.956372
Marsa Tarafi	Egypt: Red Sea	25.205046	34.808958
Marsa Tundaba	Egypt: Red Sea	24.961718	34.936523
Ras Dirra, Bir Ghadir	Egypt: Red Sea	24.894344	34.990386
Sharm Luli	Egypt: Red Sea	24.609434	35.115423
Bodkin reef	Egypt: Red Sea	23.478978	35.493572
Sharm el Madfa, Marsa Hasa	Egypt: Red Sea	22.956168	35.668514
Marsa Shaab	Egypt: Red Sea	22.842591	35.777153
Marsa el Qad	Egypt: Red Sea	22.607727	36.260299
Marsa Abu Naam	Egypt: Red Sea	22.497571	36.30929
Marsa Halaib	Egypt: Red Sea	22.225003	36.651959

Khor el Marob	Sudan	21.834019	36.859422
Marsa Ribda, Marsa Gwilaib	Sudan	21.79016	36.865975
Khor Abu Asal, Marsa Oseif	Sudan	21.759722	36.871819
Marsa Hamsiat	Sudan	21.686785	36.886603
Marsa Wasi	Sudan	21.643104	36.895915
Marsa Gafatir	Sudan	21.595219	36.919704
Marsa Abu Imama, Rio Farat	Sudan	21.489421	36.954236
Marsa Halaka, Khor Dullow, Khor Delwein	Sudan	21.401862	36.987013
Khor Shinab, Khor Abu Mishmish	Sudan	21.349183	37.010724
Marsa Salak	Sudan	20.450287	37.199426
Marsa Arakiyai, Port Salvadora	Sudan	20.233286	37.198738
Marsa Fijab, Bahia de Fuca	Sudan	20.035033	37.185976
Marsa Gwiyai, Port Dradart	Sudan	19.661469	37.238526
Port Sudan, in Marsa Sheikh Barud	Sudan	19.609159	37.227475
Marsa Ata	Sudan	19.289287	37.328189
Marsa Esh Sheikh Ibrahim	Sudan	18.875373	37.415795
Harmil island	Erythrea	16.538714	40.153202
Jimhil, Monfreid's Djumelé?	Erythrea	15.77366	39.965538
Melita bay near Ras Nasiracurra	Erythrea	15.264342	39.811446
Dellemi, Dilemni island	Erythrea	15.485589	39.889168
Ghelaelo in Howakil bay	Erythrea	15.106029	40.110639
Mersa Dudo	Erythrea	13.864934	41.907061
Ras Terma	Erythrea	13.214607	42.526752
Obock	Djibouti	11.966177	43.294719
Guinni Koma, ile du Diable, inside Ghoubbet el-Karab	Djibouti	11.532763	42.523545
Khor Shoreh, Shoora	Somalia	10.819656	45.859682
El-Kura	Gulf of Aqaba	28.475123	34.499527
Sharm el-Sheikh	Gulf of Aqaba	27.859351	34.291968
Sharm Yahar, Al Harr	Saudi Arab: Red S.	27.621703	35.520983
Sharm Dumaygh	Saudi Arab: Red S.	26.642814	36.219316
Sharm Hasy	Saudi Arab: Red S.	24.625872	37.337314
Sharm Al Khawr	Saudi Arab: Red S.	24.273912	37.673649
Yanbu Al Bahr	Saudi Arab: Red S.	24.06998	38.057044
Sherm Rabegh	Saudi Arab: Red S.	22.949484	38.888721
Al Qadimah	Saudi Arab: Red S.	22.353038	39.084469
Al Jazeerah, near Ras Hatiba	Saudi Arab: Red S.	22.088061	39.030927
Sharm Abhur, Bihar	Saudi Arab: Red S.	21.717354	39.098442
Jeddah	Saudi Arab: Red S.	21.510655	39.142121
Abu Shauk	Saudi Arab: Red S.	20.876416	39.354983
Marsa Qishran	Saudi Arab: Red S.	20.254632	40.011822
Marsa Ibrahim	Saudi Arab: Red S.	20.168463	40.229582
Khor al Humara	Saudi Arab: Red S.	19.773387	40.662476
Khor al Birk	Saudi Arab: Red S.	18.213756	41.528807
Saso, Sarso island	Saudi Arab: Red S.	16.87126	41.587623
Sajid, on Farasan Zekir island, Monfreid's Séguid	Saudi Arab: Red S.	16.836562	41.951117
Dumsuq island, Monfreid's Dumsuk	Saudi Arab: Red S.	16.553166	42.060748
Uqban island, Monfreid's Okban	Yemen	15.519617	42.378796
Mujamila island	Yemen	14.61272	42.925455
Tongue island, near Monfreid's Zoukour, Zuqar	Yemen	13.881266	42.713688

Mayyun, Perim island	Yemen	12.653101	43.42024
Khor Omeira, Monfreid's Kor Omeira	Yemen	12.638344	44.137997
Ras Imran	Yemen	12.753677	44.724326
Bal Haf, Balihaf	Yemen	13.982719	48.173209
Ras Majdahah	Yemen	14.012409	48.448849
Khor al Mukalla	Yemen	14.525882	49.123511
Khaisat, South of Ras Fartak	Yemen	15.610251	52.186919
Salalah, Raysut	Yemen	16.937126	53.999393
Sour	Oman	22.573202	59.536214
Bandar Khairan	Oman	23.519779	58.72588
Al Suwadi, Sawadi	Oman	23.785968	57.794247
Atalayoun, Marchica near Nador	Morocco	35.220721	-2.907731
Mohammedia-Fedala	Morocco	33.712125	-7.397729

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The following 'pilots' were used:

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- Spain Mediterranean coast by John Marchment, (IMRAY, 2009)
- Balears by Robin Brandon & Anne Hammick (IMRAY, 2000)
- France Western Mediterranean coast (SHOM, 2000)
- France Eastern Mediterranean coast (SHOM, 2001)
- Corsica & North Sardinia by Alain Rondeau (1997)
- Italy, Sicily, Sardinia, Malta by Rod Heikell (IMRAY, 2011)
- Adriatic Sea by Trevor Thompson (IMRAY, 2000)
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