Potential Ancient Harbours

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Abstract

Nearly 6000 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 ca. 150 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, seabed 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), Mogens Hansen & Thomas Nielsen (2004), Tiverios (2008), Nicolas Carayon (2008), Helen Dawson (2013), Anton Gordieiev (2015), Alkiviadis Ginalis et al (2019), Chiara Mauro (2019) and some up to date web sites (http://pleiades.stoa.org/ ; http://dare.ht.lu.se/ ; https://www.trismegistos.org and https://topostext.org/).

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 talk 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 ca. 6000 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 'dogleg'. 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 ca. 150 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	16
France west & south & Corsica	4
Italy, Sicily, Sardinia, other islands and Malta	12
Adriatic Sea	29
Greece & Crete	20
Black Sea	2
Turkey west & south	7
Red Sea & Oman & Somalia	56
Levant, Cyprus & North Africa	2
Total	155

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 Egypt and Sudan.

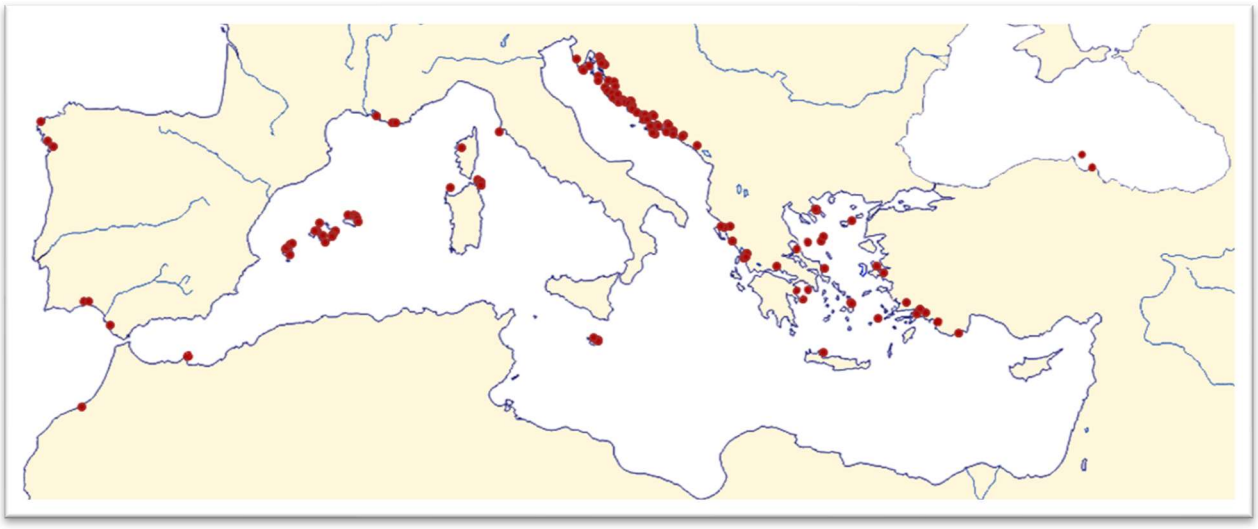

Figure 1. Potential Ancient Harbours in the Mediterranean area.

Figure 4. Potential Ancient Harbours in the Red Sea.

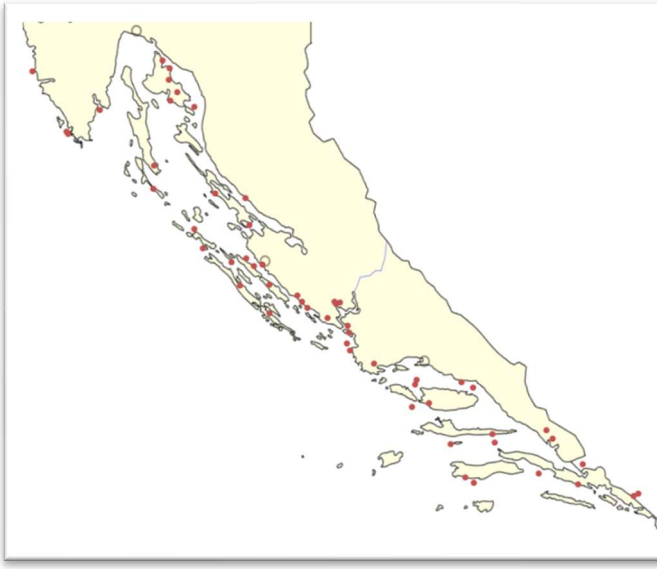

Figure 2. Potential Ancient Harbours in Croatia.

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 seaport 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 (19) 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
Sharm el-Bahari, Mangrove Bay	Egypt	25.86800	34.41800
Santido Resort	Egypt	25.83930	34.43750
Marsa Wizr	Egypt	25.78600	34.48930
Marsa Toronbi	Egypt	25.62070	34.58880
Coraya Bay	Egypt	25.60210	34.60600
Marsa Mubarak	Egypt	25.50900	34.65270
Marsa Mooray	Egypt	25.39600	34.70300
Marsa Abu Dabbab	Egypt	25.33900	34.74000
Marsa Fokairi	Egypt	24.75550	35.06760
Shams Alam Resort	Egypt	24.69000	35.08700
Unnamed cove	Egypt	24.51950	35.14100
Kala'an Gulf	Egypt	24.36000	35.29800

*: 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 which has sometimes completely changed the seascape (large deltas),
- 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 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, on R IJzer, Yzer	Belgium	51.539970	3.607700
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	39.540520	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
Cala Pi	Spain Mallorca	39.362034	2.834320
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	1.414050
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	43.082920	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	41.135830	9.495848
Porto Vecchio of Porto Cervo	Italy Sardinia	41.133359	9.536260
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	42.806320	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
Zaton Soline, on the isle of Krk	Croatia	45.155990	14.608581
Vrbnik, on the isle of Krk	Croatia	45.078000	14.672386
Bay of Kosljun, Puntarska Draga, on the isle of Krk	Croatia	45.029639	14.619498
Punta Kriza, in Uvala Ul, on the isle of Cres	Croatia	44.641311	14.503273
Luka Krivica, on the isle of Losinj	Croatia	44.500672	14.495218

Uvala Lukovo-Sugarje	Croatia	44.443888	15.18564
Uvala Jasenova	Croatia	44.282389	15.210407
Uvala Soline, in Luka Soliscica on Dugi island	Croatia	44.141501	14.866483
Kukljica, on Ugljan island	Croatia	44.033868	15.247510
LukaTelascica, on Dugi island	Croatia	43.917810	15.142861
Uvala Soline, on Pasman island	Croatia	43.924342	15.360994
Uvala Vela Luka	Croatia	43.860591	15.572466
Betina, on Murter island	Croatia	43.821538	15.604590
Jezera, on Murter island	Croatia	43.784346	15.643490
Rasline	Croatia	43.807630	15.857736
Uvala Beretusa	Croatia	43.818403	15.886719
Jadrtovac	Croatia	43.675937	15.945718
Banovci, in Luka Grebastica	Croatia	43.636672	15.957561
Kremik Marina	Croatia	43.569867	15.940943
Uvala Rasotica, on the isle of Braç	Croatia	43.307747	16.885881
Bobovisca, on the isle of Braç	Croatia	43.352859	16.461513
Blace	Croatia	43.001627	17.481396
Mali Ston	Croatia	42.847606	17.704852
Uvala Luka, near Loviste	Croatia	43.029569	17.027106
Rijeka Dubrovacka	Croatia	42.670778	18.121156
Gruz	Croatia	42.653862	18.086801
Bigova	Montenegro	42.354278	18.704058
Pagania	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	24.119460
Ormos Vathikelon	GR: Evia	38.940900	22.940174
Ormos Mesopanayia	GR: North-East	40.202842	23.780868
Ormos Kriftos	GR: North-East	40.221810	23.782357
Ormos Dhimitriaki	GR: North-East	40.226768	23.753190
Ormos Panayia	GR: North-East	40.232231	23.737014
Khaidhari, Vivari	GR: Peloponnesus	37.533736	22.921406
Limin Gouvion, on Corfu	GR: Ionian Isl.	39.654110	19.849040
Palaiokastritsa, Limin Alipa, on Corfu	GR: Ionian Isl.	39.673427	19.709291
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 Langeri, on the isle of Paros	GR: Cyclades Isl.	37.138657	25.266262
Ormos Moudhrou, on the isle of Lemnos	GR: Eastern Isl.	39.870490	25.245694
Koukounaries, on the isle of Skiathos	GR: Eastern Isl.	39.150560	23.399511
Planitis, on the isle of Pelagos	GR: Eastern Isl.	39.347330	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	35.042210
Dalyanköy	TR: West	38.353285	26.312599
Gökkovar Limani, Kokar	TR: West	38.137537	26.607011
Küyüçak	TR: West	37.153570	27.559237
Okluk Koyu, inside Degirmen Bükü	TR: West	36.920552	28.171595
Ingilizi Limani, inside Degirmen Bükü	TR: West	36.923470	28.156911

Büyük Cati	TR: West	36.790077	28.012561
Aksaz, in Karaagaç Limani	TR: South	36.840444	28.391038
Mersa Thelemet	Egypt: Red Sea	29.054510	32.635191
Merset el-Qad Yahya	Egypt: Red Sea	27.929551	33.893634
Marsa Abu Makhadiq	Egypt: Red Sea	27.041819	33.893311
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	36.309290
Marsa Gwilaib, Marsa Ribda	Sudan	21.790160	36.865975
Marsa Oseif, Khor Abu Asal	Sudan	21.759722	36.871819
Marsa Hamsiat	Sudan	21.686785	36.886603
Marsa Wasia	Sudan	21.643104	36.895915
Marsa Gafatir	Sudan	21.595219	36.919704
Marsa Halaka, near Abu Imama	Sudan	21.489421	36.954236
Marsa Shinab, Khor Abu Mishmish	Sudan	21.349183	37.010724
Marsa Fijja, Fijab, Bahia de Fuca	Sudan	20.035033	37.185976
Marsa Ata	Sudan	19.289287	37.328189
Harmil island	Eritrea	16.538714	40.153202
Melita bay near Ras Nasiracurra	Eritrea	15.264342	39.811446
Edd	Eritrea	13.933478	41.694754
Mersa Dudo	Eritrea	13.864934	41.907061
Ras Terma	Eritrea	13.214607	42.526752
Tongue island, near Monfreid's Zoukour, Zuqar	Yemen	13.881270	42.713690
As-Salif, near al-Qaryah	Yemen	15.32000	42.675000
Uqban island, Monfreid's Okban	Yemen	15.519620	42.378800
Dumsuq island, Monfreid's Dumsuk	Saudi Arab: Red S.	16.553170	42.060750
Saso, Sarso island	Saudi Arab: Red S.	16.871260	41.587620
Khor al-Birk	Saudi Arab: Red S.	18.214000	41.529000
Khor Nahud	Saudi Arab: Red S.	18.263000	41.504000
Marsa Qishran	Saudi Arab: Red S.	20.254630	40.011820
Abu Shauk	Saudi Arab: Red S.	20.876420	39.354980
Sharm Abhur, Bihar	Saudi Arab: Red S.	21.717350	39.098440
Al Jazeerah, near Ras Hatiba	Saudi Arab: Red S.	22.088060	39.030930
Al Qadimah	Saudi Arab: Red S.	22.353040	39.084470
Sharm Al Khawr	Saudi Arab: Red S.	24.273910	37.673650
Sharm Hasy	Saudi Arab: Red S.	24.625870	37.337310
Sharm Habban	Saudi Arab: Red S.	26.067420	36.572160
Sharm Antar	Saudi Arab: Red S.	26.592360	36.251000
Sharm Dumaygh	Saudi Arab: Red S.	26.642810	36.219320
Sharm Jubbah, industrial port of Duba	Saudi Arab: Red S.	27.559700	35.544000
Sharm Yahar, Al Harr	Saudi Arab: Red S.	27.621700	35.520980
Sharm el-Sheikh	Gulf of Aqaba	27.859350	34.291970
El-Kura	Gulf of Aqaba	28.475120	34.499530
Khor Shoreh, Shoora	Somalia	10.819660	45.859680
Guinni Koma, Monfreid's Gubet Karab	Djibouti	11.532760	42.523550
Tadjoura	Djibouti	11.782000	42.878000
Obock	Djibouti	11.966180	43.294720

Khor Omeira, Monfreid's Kor Omeira	Yemen	12.638340	44.138000
Ras Imran	Yemen	12.753680	44.724330
Bal Haf, Balihaf	Yemen	13.982720	48.173210
Khaisat, south of Ras Fartak	Yemen	15.815400	52.196500
Salalah, Raysut	Yemen	16.937130	53.999390
Sour	Oman	22.573200	59.536210
Bandar Khairan	Oman	23.519780	58.725880
Al Suwadi, Sawadi	Oman	23.785970	57.794250
Atalayoun, Marchica near Nador	Morocco	35.220720	-2.907730
Mohammedia-Fedala	Morocco	33.712130	-7.397730

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The following 'pilots' were used:

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- Baleares by Robin Brandon & Anne Hammick (IMRAY, 2000)
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