Hello Rod,

I am very grateful for your sending me your “Chapter 6” I did not know about. That is exactly what I need. I will not distribute your document, but refer to it. I mentioned it on my www together with a quotation from you about sea breezes and about Meltemi. I hope that is ok.

Concerning my ‘conventional assumptions’: Yes ! I need such kind of simplification to explain things clearly ! But I fully agree that sailing the Med is much more complicated …

Cdlt/BRgds

Arthur de Graauw

**De :** Rod Heikell [mailto:rodheikell@gmail.com]
**Envoyé :** mercredi 14 septembre 2016 12:12
**À :** Arthur DE GRAAUW <arthur.degraauw@outlook.fr>
**Objet :** Re: Sailing on the Med

Arthur

I'm sorry to say this but you are making conventional assumptions (Romans only sailed in the summer for eg) that modern archaeological evidence does not bear out. Did you read the Mare Clausum paper where for that small part of the world we end up with contradictory conclusions, but at least some evidence that sailing took place between the Greek islands and Egypt in the winter months.

Now it's useful to look at prevailing winds, but you would need to do that constructing wind roses for areas at different times - I did that for the Almanac using Admiralty data (from the Med Pilot), it took ages and was still not entirely satisfactory.

The wind clock is my construction, a simplification really of the sea breeze also incorporating the Coriolis effect. It's from the Adlard Coles Book of Mediterranean Cruising - but there is little more in there to interest you apart from the wind clock.

Attached is a PDF of chapter 6 of Ocean Passages and Landfalls that I wrote with Andy O'Grady. It may be of some help. Please don't publish distribute it.

Best

Rod

On 13 September 2016 at 18:07, Arthur DE GRAAUW <arthur.degraauw@outlook.fr> wrote:

Dear Rod,

I agree that we must differentiate several aspects :

Historical: (Late) Bronze Age sailing+rowing ships, and Roman sailing only ships, and modern yachts.

Targets: e.g. going to Gades or to Alexandria, because cargo was available (both ways).

Route to get there: depending on pirates, on tramping opportunities at friendly places, on wind conditions, and many other reasons.

Time of the year: summer, winter

So I try to keep it simple and concentrate on modern ships (with an eye on Roman sailing ships) in order to ‘use modern to understand ancient’. That is where you fit exactly in the picture because you know both. I concentrate on summer time as this was the main sailing season for Roman ships. I concentrate on wind conditions as I believe that is paramount for sailing.

I would need to know more about your ‘sea breeze clock’.

What book is your ‘A C Med Sailing’ exactly?

Cdlt/BRgds

Arthur de Graauw

**De :** Rod Heikell [mailto:rodheikell@gmail.com]
**Envoyé :** mardi 13 septembre 2016 12:04
**À :** Arthur DE GRAAUW arthur.degraauw@outlook.fr

**Objet :** Re: Sailing on the Med

Arthur

The problem with working out defined routes vis-a-vis weather and winds is that these were not the only factors affecting routes. Other important factors are secure and friendly harbours and anchorages, meaning not all harbours and anchorages would be accessible if the locals were hostile or just unhelpful. Trade was not just from one point to another, say Alexandria to Rhodes, but involved stopping off and selling goods and buying goods at harbours along the way. Piracy is another complicating factor and you can bet your boots that navigators talked to one another about safe and dangerous routes. At times piracy would become such a menace to trade that government forces were deployed to stamp down on it such as the state sponsored expedition by Pompey and others in c.75-60BC in Cilicia and Crete.

There is one other major factor and that is that traders aimed for places that had valuable trading commodities. Evia for pottery, Cyprus for copper, Spain for tin and so on. These factors shape routes as much or more than prevailing winds and currents.

I confess here you are ahead of me. I have been putting together thoughts on ancient routes for years now and as always get bogged down by the research. There is just so much out there. I've attached a couple of papers of interest regarding the revision of received ideas about routes, but these are just the tip of the iceberg of research.

In particular for your routes it is necessary to be time specific (in a broad sense) so early, middle and late Bronze Age and so on. It is also necessary to link trading centres to the routes in a time specific way. Add to that that if we assume some routes were used that traditionally were thought not to be viable, then it is really a complicated problem.

I know you want me to comment on the routes E-W you have up, but the answer is that all sorts of routes were used at different times and here your ancient port index coupled to the relevant time period would be a handy tracker for routes.

Anyway lets look at routes E-W though you also need to consider important trade routes SE to NW such as the Roman grain ships coming from Libya to Rome. The winds in the Med are predominantly westerlies, BUT a depression passing through the southern parts of the Med will give rise to southerlies at any time of year. Prevailing westerlies can mean as little as 20-25% of winds in some parts of the Med. You also need to look at sea breezes which are an important factor and can often have S and E components. There is a time clock for sea breezes in the Med and that can influence how ships were sailed. We can say there are two broad components for E to W which is basically Bronze Age and early Iron Age where ships were more akin to tramp steamers coasting to Cyprus, the Levant, the Turkish Aegean coast, the Aegean Islands, the Ionian and on to the western Med. Then again Caananite ships often coasted along the African coast E to W.

This all needs to be time specific and ship-type specific which is why I sent the Appendix on whether ancient ships could sail better than 90 degrees to the wind. By the way I didn't mean for you to buy Sailing Ancient Seas as it is not really specific to your questions and also involves voyaging in Tetranora - it is not really an academic exercise. It is also necessary to make a critique, often mentioned, that trading boats were both rowed and sailed when the wind was aft of the beam. As you know a rowing galley and a cargo carrier that sails are two very different things. The Ulu Burun wreck and others are instructive here.

Anyway I feel that I'm not getting closer to the simple answers you want here and that is because there are no simple answers based on any sailor's catch-all of wind and current.

I hope this helps a bit. The sea breeze clock is from my A C Med Sailing.

Rod

On 12 September 2016 at 23:17, Arthur DE GRAAUW <arthur.degraauw@outlook.fr> wrote:

Thanks a lot Rod for this info. I’ll check the books and I just bought yours.

I know it is rather complicated and I am trying to make it a bit more easy for non-sailors even if I do not wish to be simplistic.

I do need your advice on the main sailing routes in the Med. I believe some of the ones I mention on my sketch are clear (Levant to Rhodes, Black Sea, eastern Spain), but I am uncertain about E-W trips:

Crossing the Ionian Sea

Gulf of Syrt and Gabes

From Oran to Gibraltar, and Almeria to Gibraltar, is it worth crossing over from Oran to Almeria?

Any other popular ancient route.

My ambition is not to go into the details, but just to provide a general picture for the whole Med Sea.

Cdlt/BRgds

Arthur de Graauw

**De :** Rod Heikell [mailto:rodheikell@gmail.com]
**Envoyé :** lundi 12 septembre 2016 14:22
**À :** Arthur DE GRAAUW <arthur.degraauw@outlook.fr>
**Objet :** Re: Sailing on the Med

Dear Arthur

I have read with interest your sections on ancient ships/merchant ships and ancient Med routes. It's a good start but i do feel the situation is a lot more complicated. For your interest I attach Appendix 1 and a bibliography (well - more useful books than a complete bibliography) from my Sailing Ancient Seas which deals with some of the problems you look at in your sections. The merchant ships you look at relate more to the Roman era than to the Greek/Caananite era and if we take into account that Homo erectus reached Crete 130,000 years ago from North Africa in what looks like successive waves of migration, then we are pushing the boundaries and seafaring techniques way back in the history of seafaring in the Med.

Anyway have a look at the Appendix from Sailing Ancient Seas and the useful books list. This is a huge and complicated problem which, as you say, academics have not addressed from a practical geographical and climatic point of view.

All best

Rod Heikell

On 12 September 2016 at 11:07, Arthur DE GRAAUW <arthur.degraauw@outlook.fr> wrote:

Dear Rod,

Perhaps you remember I contacted you a few years ago about ancient ports … I hope you are ok and still enjoying sailing.

I just prepared a (very) brief summary of main sailing routes on the Mediterranean Sea. It is intended for historians and archaeologists who usually do not sail ships (a pity they don’t). As I have not been in as many places as you I believe you are in the best position to help me a hand by checking my text for any errors and suggesting routes that are worth mentioning (or routes that are not worth mentioning). It is not a long text and it should be easy to read for you.

Here is my work: <http://www.ancientportsantiques.com/ancient-ships/merchant-ships/#1>

In addition, I prepared a list of what I called “Potential Ancient Harbour” based on your ‘Excellent’ shelters and on my catalogue of well-known ancient ports. Perhaps you would like to have a look also: <http://www.ancientportsantiques.com/a-few-ports/potential-ancient-harbours/>

Please let me know what you think as I believe you are the most knowledgeable person in this field.

Cdlt/BRgds

Arthur de Graauw

[www.AncientPortsAntiques.com](http://www.ancientportsantiques.com/)

**SAILING ANCIENT SEAS**

**Appendix I: Could ancient ships sail to windward?**

There is plenty of evidence that ancient sailing ships plied up and down the coast with voyages against the wind. These tubby traders were difficult to row and anyway there was insufficient crew to row for long periods. That means that these voyages must have been made under sail and given the prevailing winds, voyages were often against the wind. A square rigged vessel cannot make much more than 90° to the wind so if the wind is dead against it then it would make virtually no progress against the wind.

There has been much speculation about how these traders sailed their craft around the coasts and islands of the Mediterranean, not to mention voyages in the Red Sea and Indian Ocean. Misconceptions about how these craft sailed has mostly been from some academics with little knowledge of sailing craft of this type and of the winds and sea conditions these boats faced in their everyday trade. Ancient sailing ships did not just wait for favourable winds aft of the beam or they could have waited for months. Almost certainly these sailing craft could make some progress to windward under sail.

There are two possible explanations for how ancient sailing ships went to windward. Actually there are more, but two will do for now.

1. The small forward sail rigged on a stubby mast in the bows, known as the artemon to the Romans, greatly helped the ability to go to windward. It gives balance, it directs wind through the slot over the mainsail, acting as a primitive foresail of the type found on modern yachts. It is likely that a ship rigged with an artemon could make 60°-70° to windward depending on the sea conditions. The artemon is commonly depicted on pictures of Roman sailing ships, but is also depicted in various forms in earlier periods. Casson has an illustration of the merchantman from the Tomba della Nave in Tarquinia from the early 5th century BC showing a two masted vessel that we can interpret as either an artemon or perhaps a square rigged schooner.[[1]](#footnote-1) There are also depictions of sprit rigged sails from as early as the 2nd century BC.[[2]](#footnote-2) A sprit rigged boat can make quite good progress to windward, possibly 60°-70° off the wind, because the sail is given stability by the spar as well as the cloth. The Thira friezes from Akrotiri of around 1500 BC show vessels with what looks like an artemon and may be a two masted boat. Hierro also mentions a three masted boat from the 2nd century BC.[[3]](#footnote-3)
2. If we look at the few depictions we have of craft at the time we can learn a little about square rigs and how they worked, though there has to be an allowance for artistic license on the part of the artist drawing the depiction. Nonetheless the rig of ancient square sailed vessels can be assembled from the various depictions we have of them. Up until the late Bronze Age the squaresail usually had a yard top and bottom. Around the late Bronze Age, perhaps 1000-800 BC, the bottom yard of the squaresail was lost so there was just a top yard and the bottom was loose footed. A squaresail was rigged with usually two halyards to haul the top yard and the sail up, brails to furl and reef the sail, sheets on the yard and bottom corners, a forestay, backstay and shrouds of some sort. All of this standing and running rigging would have likely been in hemp or flax cordage. With a squaresail with just a top yard it would be comparatively easy to partially brail the sail so that it more resembled a triangular or quadrilateral lateen sail. Bowse down the forward end with the top sheet while easing what becomes the forward halyard, brail the sail progressively from back to front and then re-rig any standing rigging. The advantage of this rig with the 'top' of the triangle forward of the mast is that the ability to go to windward is much increased and a lateen rigged boat could make 55°-65° off the wind and is a lot more manoeuvrable when tacking against the wind.[[4]](#footnote-4) The earliest representation of a lateen rigged boat is from around the 2nd century AD.[[5]](#footnote-5)

In 1984, at the very beginning of the excavation of the Ulu Burun shipwreck, I visited the dive site under Ulu Burun in my yacht Tetranora. The wind was heaving off the peninsula and sending little williwaws across the sea. I found an anchorage of sorts in a bight under Ulu Burun and Robin came to take me over to the dive ship, Virazon, anchored on all four sides over the wreck site. The wreck was dated to around 1300 BC and had a mixed cargo from all over the known world. The diversity of the origins of the cargo is staggering. The copper ingots probably came from Cyprus. The glass and the amphorae from the Canaanites in what is now Israel and the Lebanon. Tin ingots found on board may have originated in Afghanistan. A vase is of Mycenean origin. Unworked ivory may have come from Syria or North Africa. Most incredibly of all, amber beads found on board are of a type of amber originating in the Baltic.

The Ulu Burun wreck was around 15 metres (50 foot) long and double-ended, much like modern day tirhandil (Turkish) and trehandhiri (Greek) hull types. It is always posited that these ships had just a single squaresail with a yard at the top.[[6]](#footnote-6) From this wreck and others like the Kyrenia wreck of the 3rd to 4th century BC excavated off Kyrenia in Northern Cyprus we get a reasonable idea of what these ships were like. The problem with all this is how did they ever get around under a simple square rig.

Anyone sailing along the coast of modern day Turkey will recognise the problem. If you are sailing down the coast from the north and around to the east where the Taurus mountains bulge out into the sea, you will have the prevailing winds behind you or at least aft of the beam. This is easy sailing for ancient craft rigged with a square sail where the wind effectively blows from behind the boat and propels it forward and down the coast. The problem all historians have is just how ancient trading craft got back up the coast against the prevailing winds. This at least is the simple version of the problem, though in practice it is a great deal more complicated than this, not least because the coastal contours subtly alter the direction and strength of the wind.

One of the things about winds in the Mediterranean is that in the summer there are consistent patterns and nowhere more so than in the eastern Mediterranean. What today we call the meltemi and the ancient Greeks called the etesians has been recorded since ancient times and the ancient Greeks were as familiar with these winds as sailors are today. Maybe more so.

*In the summer months the winds in the Sea of Marmara and the Aegean are predominantly from the north, curving around the coast to blow from the west and even in places the SW in the gulfs around Bodrum, Marmaris and Fethiye. In the Aegean the constancy of the northerly winds in the summer has been noted from ancient times, when they were called the etesians, from etos (annual); today the wind is commonly called the meltemi or meltem... This wind begins blowing in June, reaches full strength in July and August, and dies off in October... In effect, the meltemi describes an arc from the NE in the Sea of Marmara through north and then to west along Turkey's Mediterranean coast. It does not blow along Turkey's southern coast eastward of Finike Korfezi. In strength it varies from Force 3-4 to Force 6-7 in July and August.[[7]](#footnote-7)*

So how did ancient ships with a simple square rig and limited crew get along this coast. It's difficult to describe in dry prose what it is like beating against the meltemi blowing at 25-30 knots (Force 6-7)[[8]](#footnote-8) into the short, sharp seas the winds set up. Even in a modern yacht with a Bermudan rig it can be hard work and often, if it all seems too much, many reach for the key and turn the engine on to help with the task. No such luck for ancient mariners. Beating to windward in these conditions is hard on the fabric of the boat, on rigging and sails, and on the crew. As you sail as close to the wind as possible spray showers back over the boat and when it hits a wave the boat shudders and slows before picking up speed again. Its as if the forces of nature are constantly conspiring to keep you from getting to where you want to go.

If beating to windward along this coast in a modern yacht is a difficult process, how on earth did the ancients do it? Some historians will posit a scenario where an ancient trading boat under square sail will wait for favourable winds or even row to the next destination[[9]](#footnote-9). The considerable flaw in this argument is that winds predominantly blows down the coast from a northerly direction, even in winter, so a trading boat might have to wait for weeks or months to get to another safe haven before northerlies set in again. And rowing a tubby trading boat is out of the question. Trading boats of this period were much like the perama[[10]](#footnote-10) that until recently used to trade around a few of the Greek islands. Unlike slim galleys, they were not designed to be rowed and relied principally on sail power. Nor is it likely that they carried enough crew to row anywhere except to get into a harbour or bay.

Boats of this era, around 2000 to 3000 years ago, are called round boats as they were quite a beamy boat in order to take a fair load of cargo while they tramped along the coast. To call them a round boat is a little unfair and their proportions are not too different from a modern sailing yacht where the maximum beam is around one third of the length[[11]](#footnote-11). They were double-enders and had a single mast in most representations, although there is the fresco from the 5th century BCE showing two masts[[12]](#footnote-12) and one of the frescoes at Akrotiri on Thira possibly showing a three master from around 3,500 years ago[[13]](#footnote-13). Having either two or three masts would have helped the windward ability of a boat, but by and large depictions of ancient boats show just a single mast.

In recent years marine archaeologists have investigated a number of ancient shipwrecks including importantly the Gelidonya boat from the 12th century BC and latterly the Ulu Burun wreck off the coast of Turkey from the 14th century BC. The Ulu Burun wreck was a typical round ship of around 15 metres in length and probably carried around 20 tons of cargo. The boat was constructed using the shell method where the planks are laid up edge-wise using pegged mortice and tenon joints. The wood was cedar, perhaps the 'cedars of Lebanon' mentioned so often in the Old Testament. Later ships were similar to the Ulu Burun wreck and it seems from the excavation of wrecks and representations of trading vessels that many of them were of this sort of size: 12-18 metres in length and carrying cargoes of 15-30 tons. In the Roman era much larger ships are mentioned, but these may have been the exception rather than the rule. Even in Columbus' time some 2000 years later we are talking about relatively small craft[[14]](#footnote-14) being used for carrying cargo.

It is likely that a simple square rig was not the only rig in use. There is the two master from the 5th century BC Etruscan fresco and the forward stubby artemon on Roman craft which would aid going to windward. Putting a simple sail such as another square sail, or more likely something like a small spritsail forward, funnels the wind over the mainsail and dramatically increases windward ability[[15]](#footnote-15).

As a sailor I am interested in getting the best out of my boat and going to windward is a matter of constantly checking sail trim and adjusting the sheets to get the best out of what you have. For the ancient sailors on round boats the impetus to get the best out of the boat would have been even more so. To get safely to the next harbour, to make the best angle against the wind, to keep things trimmed and as efficient as humanly possible. It's easy on hindsight to posit scenarios where ancient sailors looked at the rig, at the sails, and whether by design or by some serendipitous accident, worked out that they could bowse down a squaresail to approximate a lateen rig or support the sail with a spar diagonally from the mast base to the peak. Or if a skipper or owner noticed that other boats with spritsails out-performed the squaresail to windward, he would want to modify his own craft so that it would perform better than it did with the old rig. Sailors hate to be passed by other boats and even if they aren't racing... they are racing. Or from a commercial point of view the cargo is going to get to its destination quicker under a more efficient rig. Hindsight it might be, but the working sailor will understand the need, a salty imperative, to get the best out of a boat when it is sailing whether for personal pride, safety or profit.

Some commentators have doubted that sailors would have altered the rig to adapt the square sail to a lateen-like configuration citing the 'fact' that sailors are a conservative lot who stick to what they know. This seems an about-face comment when farmers and trades people in a town are the ones sticking with what they know, whereas sailors are off into little known parts of the country in boats that were unhandy and at the mercy of the wind and sea gods.

There is an interesting point about these old round boats. Over 30 years ago I talked to the Greek skipper of an old perama, a caique design very similar to the round boats, who still sailed around the islands as well as motor-sailing. He was a stubborn old sailor who still traded under sail when he could sail and only turned the diesel on when he needed it. We were talking about being hard on the wind when he told me that his old perama went to weather a lot better when it was loaded than when empty. He believed the hull form had been designed to sail when loaded and needed to take on ballast if there was no cargo. Obvious when you think about it. A loaded down caique will make a lot less leeway because the keel and hull is deeper in the water and that helps limit leeway[[16]](#footnote-16).

It used to be cited that the Greeks and Romans in the eastern Mediterranean sailed south with the etesians and westerlies in the early summer and then loaded up with cargo and sailed back in the autumn when there was the possibility there would be more southerlies. This now seems unlikely and the more likely scenario is that cargo was circulating throughout the year and that these round ships made numerous voyages throughout the year. Even in autumn there can be an awful lot of northerlies as well as a few southerlies. Did ancient ships sail to windward. You would have to conjecture that they did, but in the end while the evidence seems to point that way, there is no definitive answer to the question.

**Appendix 6. Select bibliography**

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1. Lionel Casson Ships and Seamanship in the Ancient World John Hopkins illustration 97. [↑](#footnote-ref-1)
2. Casson illustration 176. [↑](#footnote-ref-2)
3. Casson page 240. [↑](#footnote-ref-3)
4. Bronze Age Ships and Rigging H S Georgiou [↑](#footnote-ref-4)
5. Lionel Casson Ships and Seamanship in the Ancient World John Hopkins illustration 181. [↑](#footnote-ref-5)
6. See Georgiu *Bronze Age Ships* and the 360° Ulu Burun II project. The Ulu Burun II project built a full size replica of the wreck in consultation with the Institute of Nautical Archaeology and sailed it down the coast of Turkey. It was later intentionally sunk off the coast near Kas to provide a dive site demonstrating the underwater archaeological techniques used by INA in the original excavation at Ulu Burun. [↑](#footnote-ref-6)
7. *Turkish Waters and Cyprus Pilot p28-29* Rod Heikell [↑](#footnote-ref-7)
8. Wind strength can be measured either in the Beaufort scale which starts at Force 1 (calm) and goes up to Force 12 (hurricane force) or can be measured by knots (1 knot = 1 nautical mile an hour) or mph or km/sec. [↑](#footnote-ref-8)
9. See *A History of Seafaring in the Classical World* Fik Meijer Chapter 6. [↑](#footnote-ref-9)
10. A type of double-ended Greek caique commonly used for trading around the islands until the advent of the ubiquitous steel coaster. [↑](#footnote-ref-10)
11. I am talking average production yacht here and of course the hull shape of a modern yacht is a lot more refined. [↑](#footnote-ref-11)
12. Etruscan tomb painting in Tarquinia. [↑](#footnote-ref-12)
13. See Georgiu *Bronze Age Ships.* [↑](#footnote-ref-13)
14. 21 to 25 metres length overall for the ships Columbus used to cross the Atlantic. [↑](#footnote-ref-14)
15. It has commonly been thought the artemon was for balance, but it is more likely it was for windward ability. [↑](#footnote-ref-15)
16. Leeway is the sideways motion of the boat through the water as you it goes forward. All sailing craft will make some leeway when going to windward. [↑](#footnote-ref-16)