to him the helmsman *(κυβepvf∣τηs),* who was the navigating officer of the trireme. Each tier of rowers had its captain *(σroιχapχ6s).* There were also the captain of the forecastle *(πρωpti>s),* the “ keleustes ” who gave the time to the rowers, and the ship’s piper *(τpιηpaυ∖∙f∣s).* The rowers descended into the seven-foot space between the diaphragmata and took their places in regular order, beginning with the thalami tes. The economy of space was such that, as Cicero remarks, there was not room for one man more.

The improvement made in the build of their vessels by the Corinthian and Syracusan shipwrights, by which the bows were so much strengthened that they were able to meet the Athenian attack stem on *(προσβολή),* caused a change of tactics, and gave an impetus to the building of larger vessels—quadriremes and quinqueremes—in which increased oar-power was available for the propulsion of the heavier weights.

In principle these vessels were only expansions of the trireme, so far as the disposition of the rowers was concerned, but the speed could not have increased in pro­portion to the weight, and hence arose the variety of contrivances which superseded the ramming tactics of the days of Phormio. In the century that succeeded the close of the Peloponnesian War the fashion of building big vessels became prevalent. We hear of various numbers of banks of oars up to sixteen *(tκκaβtκηpη)* —the big vessel of Demetrius Poliorcetes. The famous tesseraconteres or forty-banked vessel of Ptolemy Philo­pator was in reality nothing more than a costly and ingenious toy, and never of any practical use. The fact, however, of its construction shows the extent to which the shipwright’s art had been developed among the ancients.

The Romans, who developed their naval power during the First Punic War, were deficient in naval construction till they learnt the art from their enemies the Cartha­ginians. They copied a quinquereme which had drifted on to the coast, and, with crews taught to row on frames set up on dry land, manned a fleet which we are told was built in sixty days from the time the trees were cut down. After the Punic War, in which the use of boarding tactics gave the Romans command of the sea, the larger rates —quinqueremes, hexiremes, octiremes—continued in use until at Actium the fate of the big vessels was sealed by the victory of the light Liburnian galleys. The larger classes, though still employed as guardships for some time, fell into disuse, and the art of building them and the knowledge of their interior arrangements were lost.

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| --- | --- | --- | --- | --- |
| *Table of Measurements, &c., after Graser.* | | | | |
|  | Trireme. | Quinquereme. | Tesseraconteres. |  |
| Length, exclusive of beak. | (?) 149 ft. @@1 | 168 ft. | 420 ft |  |
| Beam, greatest  Passage between δια≠ραγ- | 18 „ | 26 „ | 76 „ |  |
| μara | 7 „ | 11 „ | 49 „ |  |
| Draught | 81/2,, | 11 1/2,, | 20 „ |  |
| Tons measurement | (?) 232 | 534 | 11,320 (?) |  |
| Number of rowers | 174 | 310 | 4,054 |  |
| Crew, total complement... | 225 | 375 | 7,500 |  |

*Mediæval Ships.—* It is not at present possible to trace in its successive stages the transition from the ancient ship of war to the mediaeval galley. The sailing vessels of the time of the early Roman empire, such as that in which St Paul suffered shipwreck or the great merchantman described by Lucian, were the direct precursors, not only of the mediaeval merchant vessels, but also of the large sailing vessels which, after the invention of gunpowder, and the consequent necessity of carrying marine artillery, superseded the long low galleys propelled by oars. The battle of Actium gave the death-blow to the ancient type of vessel with its many banks of oars. The light

Liburnian galleys which, though fully decked, were aphract, and, according to Lucan’s testimony (bk. iii.),

Ordine contentæ gemino crevisse Liburnæ,

had only two banks of oars, were biremes. This appar­ently became the type of Roman war galleys ; and, though the old name trireme survived, its meaning became simply “ man of war,” and did not any longer imply three banks of oars. Light vessels were in vogue, and galleys with single banks of oars are common in the representations on coins and in such frescos as survive, but trireme and quinquereme, &c., have vanished.

A cloud of obscurity rests on these, the dark ages of naval history. We know nothing of the character and composition of the fleet in which Ricimer defeated the Vandals in the 5th century of our era. Nor have we any details of the fleets of the Byzantine empire until the end of the 9th century, when a light is thrown upon the subject by the *Tactica* of the emperor Leo. This emperor, in giving his directions as to the constitution of his fleet, prescribes that dromones (δpo∕xωv∈s)—that is, triremes— are to be got ready in the dockyards with a view to a naval engagement. The vessels are not to be too light or too heavy. They are to be armed with siphons for the projection of Greek fire. They are to have two banks of oars, with twenty-five rowers a-piece, on each side. Some of the vessels are to be large enough to carry two hundred men ; others are to be smaller, like those called galleys or one-banked vessels, swift and light (eλαττoυv δpoμικωτuτoυς oiortt γαλα(ας ?; *μονή pas λeγoμivovς* τaχιvoυς κai *ιλa<f>povς).* Here we have the name galleys distinctively attached to vessels with one bank of oars. This passage should have saved much of the labour that has been thrown away in attempting to prove that the distribution of rowers in the mediaeval galleys was upon the same principle as that observed in the ancient biremes or triremes.

The light thrown by the philosophic Byzantine on the naval construction and equipment of his time is but a passing flash. After the 9th century there is darkness again until the 11th and 12th centuries, when the features of the mediaeval galley first begin to be visible. And here perhaps it is not out of place to say that it is necessary to distinguish between those imaginary representations of the antique in which painters, such as Tintoret, give fanciful arrangement to the oars of their galleys, so as to meet their ideas of bireme or trireme, from those that are historically faithful and figure, perhaps in an ungainly and inartistic manner, the galleys of Venice and Genoa as they appeared in the Middle Ages. It would exceed the space at our disposal here to enter into details which can be gathered from Jal’s *Archéologie Navale* and the *Glossaire Nautique* of the same author, or the later works of Admiral Jurien de la Gravière and Admiral Fincati. It must suffice to indicate here a few of the main charac­teristics in which the mediæval galley differs from the ancient, and exhibits the last development of man-power as applied to motion in vessels larger than the boats of the present day.

These characteristics may be sketched briefly. Upon the mediæval galley, which was essentially a one-banked galley *(μονόκροτον),* the use of the longer oar or sweep took the place of the small paddling oars of the ancient vessel. The increased length of the oar requiring for its efficiency greater power than one man could employ led to the use of more than one man to an oar. The necessity therefore arose of placing the weight (or point at which the oar, used as a lever, worked against the thowl, and so pressed against the water, which is the fulcrum) at a greater distance from the force or man who moved the lever. This was gained by the invention of the apostis.

@@@1 Taking the interscalmium at *4* feet ; but this does not agree with Vitruvius, who gives 2 cubits.