XXIX.—*The Myth of the Ship-holder*: Studies in Echeneis or Remora.*—I. By E. W. Gudger, State Normal College, Greensboro, N.C., U.S.A.

[Plates XV.–XVII.]

Contents.

Introduction.

Ever since the time of Aristotle, the ship-holder or sucking-fish, because of its peculiar structure and habits, has greatly interested men both scientific and unscientific. Possessed of a suctorial disk on the head and the shoulder region, it is able to attach itself to whales, porpoises, turtles, rays, and sharks, or to large fishes of any kind, and thus secure transportation and opportunity to obtain food without exertion. It likewise attaches itself to boats, ships, floating wrecks, or even logs in the same way and for the same purpose. From this it is an easy transition to the belief of the ancients that attaching itself thus to a vessel it might retard or even hold it back. Hence the name *Echeneis*, one that holds back a ship, and *Remora*, a holding back.

"There is scarcely a fish of the existence of which the ancients have been equally certain, and which has so much occupied their imagination—from a power thought to be inherent in the creature to counteract the strongest physical agencies,—as the *Echeneis* of the Greeks or the *Remora* of the Latins." †

* In gathering the material for this paper, I am under much obligation to Dr. C. R. Eastman of the American Museum of Natural History, New York City, and to Dr. H. M. Lydenberg, Reference Librarian of the New York Public Library. In his work for the American Museum on the great bibliography of fishes, Dr. Eastman ran across and kindly transmitted to me a large number of the references made use of in this paper. Dr. Lydenberg has, as heretofore, been a court of last resort for obscure and seemingly unintelligible references, every one of which he has, by reason of his large knowledge of matters bibliographical, been able to clear up. My best thanks are hereby rendered to him and to Dr. Eastman for their many kindnesses.

† Günther, 'On the History of Echeneis,' 1860.

The earliest references to this interesting fish are to be found in Aristotle's 'History of Animals.' A fish having such an extraordinary structure as the sucking-disk and having such unusual habits could hardly be expected to have escaped the keen observation of the Father of Natural History. Yet there is nothing in Aristotle's writings to indicate that he ever saw or at any rate that he ever examined the Echeneis with the care which he bestowed on the other animals of which he wrote. In Prof. D'Arcy W. Thompson's scholarly translation (Oxford, 1910), one may read (Book II. 14, 505 *b*, 19–22): "Of fishes whose habitat is in the vicinity of rocks there is a tiny one, which some call the Echeneis or 'ship-holder' . . . . Some people assert that it has feet, but this is not the case: it appears, however, to be furnished with feet from the fact that its fins resemble these organs." Again (Book V. 31, 557 *a*, 30–31): "In the seas between Cyrene and Egypt there is a fish that attends on the dolphin which is called the 'dolphin's louse.' This fish gets exceedingly fat from enjoying an abundance of food while the dolphin is out in pursuit of its prey."

In a footnote, Prof. Thompson identifies this fish as *Naucrates ductor*, a pilot-fish found in the Mediterranean. Now the term pilot-fish is applied rather indefinitely to a number of different fishes. The *Echeneis* or *Remora* is possibly the one best known, from its habit of sticking to dolphins, sharks, or any large fishes and swimming before their snouts. In our waters *Seriola zonata* and *S. carolinensis*, amber-fishes of the family Carangidæ, are found associated with sharks and are called pilot-fishes. They are likewise found around the rudders of vessels and hence are also called rudder-fishes. The *Naucrates ductor* of Prof. Thompson is a pilot-fish of the same family but of a different genus. It is found in warm waters throughout the world and has the same habits as the other pilot-fishes.

Thompson's footnote thus leads one away from the idea that the "dolphin's louse" is a sucking-fish, but it should be noted that this last reference comes in a section devoted to sucking insect parasites, lice, ticks, and fleas, and concludes with those crustaceans, "sea-lice" so called, which live parasitically on fishes. So from this internal evidence it seems probable that the fish referred to is an Echeneid, a sucking-fish, which attaches itself in a louse fashion to the dolphin as these fish are known to do *.

* In a short note published in 'Science' for September 1, 1916, the present writer endeavoured to show that Prof. Thompson's identification

In corroboration of the foregoing, Hasselquist may be quoted. In his 'Journey to Palestine' (1757) he notes that the Arabs at Alexandria called the sucking-fish (*Echeneis neucrates*) "*Chamel l Ferrhun.*" Dr. Frank R. Blake of the Johns Hopkins University has been good enough to pass on this Arabic name. He writes that *Chamel* means louse, and that *ferrhun* is probably—or, at any rate, possibly —an erroneous transliteration for the Arabic *ferihun*, meaning agile or nimble. And that this meaning fits the actions of the fish, anyone knows who has ever tried to catch with a dip-net a shark-sucker from off its selachian host—it dodges as expertly as a squirrel around a tree. However, Dr. Blake says that there is an Ethiopic word *ferihun*, meaning terrible, and that Hasselquist's name may mean "the louse of the terrible one," and since this fish is found most frequently adhering to the shark, this translation seems the most logical one.

In further corroboration of the contention that the "dolphin's louse" is the *Echeneis*, another eastern traveller, Forskäl (1775), may also be quoted. At Djidda, a town on the eastern side of the Red Sea about midway between Suez and Aden, Forskäl collected *Echeneis neucrates*, and was at especial pains to note that the Arab fishermen there called it "Keide" or "Kaml el Kersh," which he translates "the louse of the shark"; while at Loheia, a town on the same side of the sea, but further towards the south-east, it is called "Keda." Dr. Blake has further obliged me by passing on these terms also. He finds that "Kaml el Kersh" means "the louse of the fish of prey," which fish Forskäl tells us in the context was a shark belonging to the genus *Carcharias*. *Keda*, he thinks, is probably a transliteration of the Arabic *Keide*, a fetter or band, hence "the attached one." Still other testimony may be adduced as to the even more recent use of this name. The German traveller Rüppell in his 'Fische des Rothen Meeres' (1835), published only some eighty years ago, says of Echeneis: "In the northern part of the Red Sea it is called *Delka* or else *Gammel el Kersh*,

---

of the dolphin's louse as *Naucrates ductor* is erroneous as is Aristotle's calling the little fish which lives among rocks Echeneis. The latter was identified as a goby and the "dolphin's louse" was shown to be a sucker-fish. Prof. Thompson on receiving this short paper very kindly wrote me that, while there might be still some uncertainty about the rock-dweller, he agreed as to the identity of the "dolphin's louse." And now it seems well to incorporate this note in these introductory paragraphs and to add certain other data which have come to hand since the above article was published.

in the southern part *Kied.*" The latter names are, of course, variations of those noted above. Dr. Blake has not been able to throw any light on the word *Delka.*

From all this we see that, in the near East where changes take place slowly, Echeneis was still called "louse" some two thousand years after Aristotle. While to-day in our own waters, as well as in most tropical seas, there is a certain small Echeneid fish which Gill (1862) has named *Phthirichthys lineatus*, the striped louse-fish.

To return now to Prof. Thompson's "tiny fish whose habitat is in the vicinity of rocks." It seems to me that this fish cannot possibly be an Echeneis. The Echeneis is not a "tiny" fish, since the adult forms generally range in length from ten inches to three feet; likewise, so far as is known to naturalists, it does not dwell among rocks. In fish literature of the medieval and renaissance times, however, we do frequently run across references to Echeneis as a dweller among rocks, but I take these accounts to be merely echoes of Aristotle, since they are in other respects mere copies of preceding writers. Furthermore, this fish is said to have feet or, at any rate, fins resembling such organs. To the present writer there is no doubt that the fish here referred to is a goby, for gobies are small fish, are found in or near rocks, and have their forwardly-placed pelvic fins transformed into hand-like or sucker-like prehensile organs*.

The Myth of the Ship-holder.

It will be remembered that Aristotle (384–322 B.C.) calls our fish Echeneis, ship-holder, but that he nowhere refers to the miraculous power alluded to by other but later writers. So it is doubtful whether he knew of these alleged powers, *but if that be true why should he have named it ship-holder*? His words are "which some call the Echeneis or 'ship-holder,'" and he is evidently quoting some previous writer, or giving the name in common or everyday use. One thing is clear, *i. e.* he is *not* the originator of the term, nor is it very evident that he knew the fish by personal observation.

Before bringing to the attention of the reader the various stories ascribing miraculous powers to our fishes,

* Since writing the above I have found that Lowe, so long ago as 1843, expressed the belief that Aristotle's Echeneis was a blenny or a goby or a *Chironectes* and that the dolphin's louse was an Echeneis. On both of these points Günther (1860, 1880) likewise is in agreement with the author of the 'History of the Fishes of Madeira.' Day (1880–84) also has briefly expressed his belief in this identification.

figures of the fishes themselves are presented. Pl. XV. of this paper shows *Leptecheneis naucrates* (fig. 2) and *Remora brachyptera* (fig. 3), which are commonly found in our Atlantic waters. The essential external differences between the fishes are readily seen from the figures. Fig. 1 shows the sucking-disk of the Remora. Consideration of the structures of these fishes is reserved for a later paper.

The first definite reference to the ship-retarding power of the Echeneis is in a poem on fishing, "Halieutica," by the Latin poet, Ovid (43 B.C.–17 or 18 A.D.). Verse 99 reads: "Parva Echeneis adest, mirum, mora puppibus ingens"; which may be translated, "The small Echeneis is present, wonderful to say, a great hindrance to ships."

Pliny the Elder (23–79 A.D.) twice refers to the Echeneis. In Book IX. Chapter 41 of his 'History of Animals' he says: "It is believed that when it (Echeneis) has attached itself to the keel of a ship its progress is impeded, and that it is from this circumstance that it takes its name." This (together with other data extraneous to our subject) is taken from Aristotle. Then Pliny quotes one Mucianus (about whom nothing has been obtained) that a murex, a kind of gasteropod mollusk, has a similar ship-retarding power, and gives from this writer an alleged instance of a ship being held by it. Pliny in the same chapter quotes one Trebius Niger that the fish is about one foot in length and that it can retard ships. I have been unable to find out anything about this writer; this reference, like the one to Mucianus, is entirely obscure *.

In Book XXXII. Chapter 1, Pliny gives what is the first detailed account of the ship-holding power possessed by the Echeneis, and it seems well to quote him *in extenso* as given in Bostock and Riley's translation (1857).

"And yet all these forces [winds, tides, &c.] . . . . . a single fish, and that of a very diminutive size . . . . the fish known as the 'Echeneis' . . . . possesses the power of counteracting . . . . . A fish bridles the impetuous violence

* Pliny also gives two other uses of the Echeneis, which though outside the scope of this paper, are of enough interest to appear in a footnote. The first (which he seems to have had from the Greeks) is its use in love philters, and for the purpose of delaying judgments and legal proceedings; all of which he justly says are evil properties, compensated for, however, by its use to stay the flow of blood in pregnancy and for the preservation of the fœtus *in utero*. The second use, quoted from Trebius Niger, is that when preserved in salt it is able to draw up gold from the bottom of the deepest well. These fictions are gravely repeated by many writers down to the middle of the seventeenth century . . . . at least as late as the time of Rabelais (1553).

of the deep, and subdues the frantic rage of the universe—and all this by no effort of its own, no act of resistance on its part, no act at all, in fact, but that of adhering to the bark . . . . .

"At the battle of Actium, it is said, a fish of this kind stopped the praetorian ship of Antonius in its course, at the moment he was hastening from ship to ship to encourage and exhort his men, and so compelled him to leave it and go aboard another. Hence it was, that the fleet of Caesar gained the advantage in the onset, and charged with redoubled impetuosity. In our own time too, one of these fish arrested the ship of the Emperor Caius (Caligula) in its course when he was returning from Astura to Antium: and thus, as the result proved, did an insignificant fish give presage of great events; for no sooner had the emperor returned to Rome than he was pierced by the weapons of his own soldiers. Nor did this sudden stoppage of the ship long remain a mystery; the cause being perceived upon finding that, out of the whole fleet, the emperor's five-banked galley was the only one that was making no way. The moment this was discovered some of the sailors plunged into the sea, and on making a search about the ship's sides, they found an Echeneis adhering to the rudder. Upon its being shown to the emperor, he strongly expressed his indignation that such an obstacle as this should have impeded his progress, and have rendered powerless the hearty endeavours of some four hundred men. One thing too, it is well known, more particularly surprised him, how it was possible that the fish, while adhering to the ship, should arrest its progress, and yet have no such power when brought on board"*.

This full and circumstantial account by Pliny is of great value, and the more so since everything leads one to believe in Pliny's full credence in the wonderful power of the ship-stayer. In the paragraph following the above, our old Roman naturalist thus refers to its Latin name: "Some of our own authors have given this fish the Latin name of 'mora' [delay]," another reading gives "remora."

The next of the ancients to write of our fish is the famous historian, Plutarch (46 A.D.). In his 'Symposiacs,' Book II.

* Bostock and Riley say in a footnote, "And well might it surprise him. If there was any foundation at all for the story, there can be little doubt that a trick was played for the purpose of imposing on Caligula's superstitious credulity and the rowers as well as the diving sailors were privy to it." Later it will be shown how entirely erroneous is this conjectural explanation of Pliny's translators.

question 7, he says: "Chæremonianus the Thrallian, when we were at a very noble fish dinner, pointing to a little, long, sharp-headed fish, said the Echeneis (ship-stopper) was like that, for he had often seen it as he sailed in the Sicilian sea, and wondered at its strange force; for it stopped the ship when under full sail, till one of the seamen perceived it sticking to the outside of the ship and took it off." But there was incredulity even in that day for Plutarch adds, "Some laughed at Chaeremonianus for believing such an incredible and unlikely story." Then Plutarch offers for this phenomenon an explanation of his own which will be given later.

Next we come to Oppian, who flourished late in 200 A.D. In his poem Halieutica—"On the Nature of Fishes and the Fishing of the Ancients"—as translated by John Jones, there are some 38 lines in which in very poetical and effusive fashion the action of the "sucking-fish" is described. In short, he tells how the fish clings to the keel of the swift ship and retards it, though the wind causes the sails to belly out. He seems, however, to have confused with the Echeneis the lamprey eel which has a round suctorial mouth.

The last of the ancients to catalogue the myth of the ship-detainer was Aelian, a Roman author contemporary with Oppian in the latter part of the third century A.D. In his 'De Natura Animalium,' Book I. Chapter 36, he refers to "that fish which all men call remora because it holds back and delays ships." And, again, in Book III. Chapter 17, he tells us in very interesting fashion that: "Echeneis is a pelagic fish, black in appearance, equal in length to an average-sized eel, and named for the thing it does. For adhering with its teeth to the extreme stern of a ship driven by a following wind and full sails, just as an unmastered and unbridled horse is held in with a strong rein, so the fish overcomes the most violent onset of the winds and holds the ship as if tied fast to her wharf. In vain the middle sails belly out, in vain the winds rush forth, it holds steady the thing to which it adheres. The sailors know this indeed for the cause of this matter. Hence the name given to this fish, which, because of their experience with it, they call Echeneida (Remora)."

We next hear of the ship-holder in the writings of the early Christian Fathers, and I am able, thanks to the kind help of Dr. Eastman, to quote herein from two. The first of these seems to have been Saint Basil, sometimes called the Great, bishop of Caesarea in Cappadocia. In his

Hexameron *, Homily VII. paragraph 56, he writes: "If now you hear say that the greatest vessels sailing with full sails are easily stopped by a very small fish, by the Remora, and so forcibly that the ship remains motionless for a long time, as if it had taken root in the middle of the sea, do you not see in this little creature a like proof of the power of the creator?"

St. Ambrose (340–397) in his 'Hexameron,' the first edition of which bears the imprint Basileæ, 1566, describes Echinus (probably a misspelling of Echeneis) as a foreteller of storms. "At the approach of a tempest the fish lays hold of a rock and sticks fast to it until calm weather returns. The sailors, noting this, govern themselves accordingly." This is probably an echo of Aristotle's little fish found among rocks, and seems to be the first of a long succession of similar stories, ascribing to this fish weather-forecasting powers. St. Ambrose, however, does not seem to give the ship-holding story.

Jorath, who was probably an Oriental Christian of the twelfth century, speaks of a fish called Achandes which sticks fast to ships in the sea, thus making them to stand stock still †.

About the year 1250, Bartholomew Anglicus wrote his encyclopedic work 'De Proprietatibus Rebus,' which was translated by John Trevisa in 1397, and printed at Winchester in 1491. The following is his interesting account of the ship-holder, for which also I am indebted to the kindness of Dr. Eastman:—

"Enchirius is a little fish unneth [only] half a foot long; for though he be full little of body, nathless he is most of virtue. For he cleaveth to the ship, and holdeth it still steadfastly in the sea, as though the ship were on ground therein. Tho' winds blow, and waves rise strongly, and wood [violent] storms, that ship may not move nother [neither] pass. And that fish holdeth not still the ship by no craft but only by cleaving to the ship."

In 1475, Johann von Cuba (or Cube) published at Metz his 'Hortus Sanitatis.' In the edition of 1536 on page 78 of chapter 34 he discourses of Echeneis or Echinus. This,

* "Hexameron is the title of nine homilies delivered by St. Basil on the cosmogony of the opening chapters of Genesis . . . . . Basil read the book of Genesis in the light of scientific knowledge of his day." He was born in 329 and died in his fiftieth year.

† For this reference I am indebted to Dr. Eastman, who ran across it on page 71 of Von Cuba's 'Hortus Sanitatis,' to which reference will be made later.

he says, is a little foot and a half long fish which lays hold of ships and causes them to stand still as if rooted in the sea, being held by nothing save the little fish. His story adds nothing to what we already know, but he does one thing which is of great interest, he gives us a quaint figure, which so far as I have been able to find, is the first and only effort to illustrate the myth. It is reproduced as fig. 4 (Pl. XV.). And in this connection one is led to wonder why this story, so interesting to these old-time writers, was not also a favourite theme for illustrators, why it has come down to us with but one picture.

In the 'Annotationes' of Francisco Massari, published at Basiliæ in 1537, there are in chapter 35 some three or four pages of data on the Echeneis, but careful perusal shows that this is but a revamping of the ancients with not a single new legend added, so Massari may be passed without further comment.

In the year 1550 there was published at Lugduni 'Liber I. De Sympathia et Antipathia Rerum' by Hieronymous Frascatorius, on page 24 of which is the statement that, "Furthermore it seems to be beyond all doubt that Echeneis is that little fish which we call Remora, which causes to stand still in mid-ocean the ship moved by the force and impetus of the wind"*.

According to both Gesner and Aldrovandi, there is to be found an account of the ship-holding power of Echeneis in Adam Lonicer's 'Naturalis Historiæ Opus Novum in Quo Tractatur de Natura,' etc., Frankfurt, 1551. The only edition found in New York is the German translation, which appeared as 'Kreuterbuch' in 1560. Dr. Lydenberg kindly looked through the 1682 edition of this in the New York Public Library, but could not find any reference to Echeneis. I have not been able to locate another copy. However, in Gesner's 'Historia Animalium,' IV. (1558), and also in Aldrovandi, there is a considerable quotation from Lonicer with reference to Echeneis. Careful study of this, however, shows that no new data are given.

The account of Edward Wotton (1552) is but a rehash of Aristotle, Pliny, and the other Greek and Roman writers. His one statement worthy of repetition reads "Let the winds rush and the tempests rage, the Remora dominates the furor, overcomes these great forces, and compels the vessels to stand still, which no chain and anchor have been

* For a transcript of Frascatorius I am indebted to the courtesy of Mr. Charles Perry Fisher, Librarian of the College of Physicians, Philadelphia.

made heavy enough to do." This, however, seems to be taken from Pliny.

In the sayings of Pantagruel, Rabelais (1553), in Book IV. Chapter 62, has the following:—". . . . an Echeneis or Remora, a silly, weakly fish, in spite of all the winds that blow from the thirty-two points of the compass, will in the midst of a hurricane make you the biggest first-rate remain stock still, as if she were becalmed, or the blustering tribe had blown their last." And again, in Book V. Chapter 26: ". . . . there (in the country of Satin) I saw a Remora, a little fish called by the Greeks Echeneis, near a big ship which was motionless although under full sail, on the high sea."

We now come to Rondelet (1558), who attempts to show that the retardation of ships might have been effected by the Echeneis of Pliny, the great shell-fish of Mucian, or the eel of Oppian. Indeed, he asseverates (page 313) that he has known a lamprey to thus hold back a boat: ". . . it [Oppian's eel] stops it and holds it [a boat] back; a thing which corresponds to our lamprey, and which I have known through experience, for if it puts its mouth against a boat it stops it, and I have seen it thus." Then he adds, "There is no need to marvel that various fishes are called by different authors by the same name, nor that the same fish be called by many and divers names, for that often happens." For the rest, Rondelet quotes and comments on the accounts of Pliny and others on the true Echeneis (pp. 334–5), but adds nothing of himself. More might be expected of this great ichthyologist; but it seems that he never saw the fish (he gives no figure of it) and knew nothing of it at first-hand.

Conrad Gesner was the greatest of the encyclopedic writers of natural history, and his 'Historia Animalium,' Books I.–IIII., was published Basel, 1551–1558*. In Book IIII. he discourses at considerable length "Concerning Echeneis or Remora," but there is nothing in his writings to indicate that he ever saw the fish. He adds no new data; but this section of his book is of value because in it he quotes a large number of the writers previously cited in this paper. However, even here his value to the student of ichthyological archæology is crippled by the fact

* It will be noted that the works cited of both Gesner and Rondelet are dated 1558, and yet Gesner quotes Rondelet at considerable length. However, the apparent discrepancy disappears when it is remembered that Rondelet's 'L'Histoire Entière des Poissons' is but a translation into his native French of his original work first published in Latin in 1554.

that he quotes his predecessors by name only, rarely by book or chapter. He adds nothing to our knowledge of the Myth.

Gesner, however, is the first writer since the ancients to attempt a description of Echeneis. This description, which is found in the last paragraph of his section on the Echeneis, is evidently that of a goby, and is quoted here that the reader may judge for himself, and not be led into the error of crediting Gesner with the first description.

"There is a little fish found in the ocean at Emda in Frisia (so a certain friend has related to me) four digits long, of very slimy skin, without scales, having a head large in proportion to its body, eyes small, the rest of the body cone-shaped. Under its chin it had the form of a sucker by which it probably adheres to rocks, for when he pressed this cavity with his finger (so my friend narrated it) it adhered to it so that it could be carried about."

In Chapter XXXVII. of Liber X. of his 'Operum,' published at Lugduni in 1564, Jerome Cardan writes of the action of the Remora as if it were a settled fact, but adds nothing of value to detain us here. He will be referred to later as offering an explanation of the ship-staying powers of the fish.

Departing from the beaten track of repeating what some previous writer had copied, the Dutchman, Jan Huygen van Linschoten, or, as his name is Latinized, Joannes Hugo Linscotanus (1596), gives the following interesting and detailed account of the ship-holding power of the Remora:—

"And because I am now in hand with the Fishes of India, I will here declare a short and true Historie of a Fish, although to some it may seeme incredible, but it standeth painted in the Viceroyes Pallace in India, and was set downe by true and credible witnesses that it was so, and therefore it standeth there for memorie of a wonderful thing; together with the names and surnames of the ship, Captaine, day, & yere when it was done, and as yet there are men living at this day, that were in the same shippe and adventure, for that it not long since, and it was thus. That a ship sayling from Mosambique into India, and they having faire weather, a good fore winde, as much as the Sayles might brave before the winde, for the space of fourteene dayes together, directing their course towards the Equinoctiall line, every day as they tooke the height of the Sunne, in stead of diminishing or lessening their degrees, according to the Winde and course they had and held, they found themselves still contrarie, and every day further backwards then they were, to the

great admiration and wondering of them all, and contrarie to all reason and man's understanding, so that they did not only wonder thereat, but were much abasht beeing steadfastly perswaded that they were bewitched, for they knew very well by experience that the streame or course of the water in these countries did not drive them back, nor withholde them contrarie to all Art of Navigation, whereupon they were all in great perplexity and feare, standing still and beholding each other, not once knowing the cause thereof.

"At ye last the chiefe Boteson, whom they call the masters mate, looking by chance overbord towards the beakhead of the ship, he espied a great broad taile of a Fish that had winded itselfe as it were about the beakehead, the body thereof beeing under the keele, and the heade under the Ruther, swimming in that manner, and drawing the shippe with her against the wind and their right course: whereby presently they knewe the cause of their so going backewards: so that having at last stricken long with staves and other weapons uppon the fishes taile, in the ende they stroke it off, and thereby the fish left the ship, after it had layne 14 dayes under the same, drawing the ship with it against wind and weather: for which cause the Viceroy in Goa caused it to be painted in his pallace for a perpetuall memory, where I have often read it, with the day and the time, and the name of both shippe and Captaine, which I cannot well remember, although it bee no great matter" *.

Ferrante Imperato, a pharmacist of Naples, having a taste for natural history, formed a collection of such objects, and made the description of these the basis of his book 'Historia Naturale,' published at Venetia, 1599. In this he writes: "Although the Remora of the ancients has by many been described under the forms of different fishes, there is, however, no description that fits except the one proposed by us. It has on the upperpart of the head tentacles similar to the vibratile combs [cirri, literally ringlets] of the polyps by which it attaches itself to ships or the bodies of large whales and other fishes."

With the above description Imperato published a figure of

* Linschoten's book was first published in Dutch at Amsterdam in 1596, but was translated into English and published in London in 1598, while in the following year (1599) a Latin version appeared at Amsterdam. The above account is taken literally from the English edition. For photostats of it and of the original Dutch edition I am indebted to the kindness of Dr. Lydenberg, who not only sent these, but who had previously in a most skilful manner run down Linschoten from an exceedingly indefinite and obscure reference in Nieremberg to the "Pro-Rex of Joannes Hugo."

Echeneis or Remora which, so far as I have been able to find, is the earliest portrayal of the sucking-fish. This is reproduced herein as fig. 5 (Pl. XVI.). It correctly shows the projecting lower jaw, the position and general make-up of the sucking-disk, and the position of all fins, especially the long dorsal and ventral ones. The tail is not good. It is probably a Remora, since there is no effort to portray the lateral stripe of Echeneis. The crudity of the figure is, of course, apparent, but it is the *first*, and it is a fair portrayal. The disk is clearly shown, and in the description its function is definitely indicated for the first time in history *.

We come now to another original story of the wonderful power of the Remora. It is quoted from Ekman (who will be referred to later), who says that it was told by Bartolomeo Crescentio Romano in his book 'Nautica Mediterranea' published at Rome in 1607. This book I have not seen.

". . . . and I must tell you about another deed of the devil, because you must know in how many ways this enemy of mankind works against poor seamen.

"On a voyage from Gaeta to Napoli, the galley 'S. Lucia,' when sailing before a fresh wind and being two miles from port, stopped quite immovable in spite of her sail being strained. The steersman examined the rudder to see whether there was some rope or net fastened to it, and as nothing was found, he commanded the oars to be got out and the galley slaves to be forced on with hard blows. But the galley did not move from the spot, and when she had been lying motionless for a quarter of a hour or more, the other galleys, which had sailed on, shortened sails, waiting. Then a man named Catelano told the captain . . . . to have three monks removed from the deck of the galley, and averred that the galley would then immediately begin to move; and when the captain had them removed, the galley certainly did begin to speed like an arrow.

"Then all the men were about to throw these three poor fellows into the sea, saying that they were excommunicated; but the same man Catelano helped them saying, that this was a strategem of the devil to the detriment of the monks; and he obtained permission that they should only be taken from the vessel.

"This occurrence would have caused scientific men to suppose that a very small fish, resisting the progress of the

* The above figure and description are taken from the 1599 edition of Imperato's book found in the library of the Academy of Natural Sciences of Philadelphia. For it I am indebted to the kindness of Dr. Edward J. Nolan, Librarian.

vessel, had got the better of the force of the sails and oars and made the vessel stop."

We next come to another great ichthyological encyclopedist of the Renaissance, Ulyssis Aldrovandi, whose huge folio, 'De Piscibus et de Cetis,' was published in 1613 at Bononiæ. This author devotes to the Remora some five pages, which are taken chiefly from Gesner. He discourses at considerable length of the ship-holding power of the Remora, and quotes Aristotle, Pliny, Rondelet, and several others of the authors previously considered in the present paper. However, it seems probable that he never saw the fish—at any rate, a careful translation of his very difficult Latin nowhere reveals any definite statement that he had seen it. However, he does the one good thing of giving us a figure and description which adds materially to our knowledge. A photographic reproduction of his drawing is given here as fig. 6 (Pl. XVI.). Note that it is labelled the "Remora of Imperato and the author." Aldrovandi expressly says ". . . my drawing corresponds with that one's," but his figure looks like an Echeneis, and his description below confirms this idea. He says :—

"The color of the whole body almost inclines to violet, its sides are glistening, the body is cut into two in the middle by a sub-green line, and its tail verges to blue. There are six fins to the body, three on the belly, two each in the region of the stomach and one at the anus. Likewise there is one on the back, and the tail ends in another . . . . Its mouth is not unlike a dog's except that the lower jaw projects beyond the upper jaw contrary to that which we see in the shark. I think that this is a truer figure [than Imperato's]" *.

This description seems to have been made from the fish rather than from the drawing, since the latter does not show the median line. It is to be regretted that Aldrovandi does not give us a definite statement on this point.

Aldrovandi, in his discussion of the Remora, gives this interesting incident :—"Within the memory of our parents, it is said that the ship of Franciscus Turonensis, the Cardinal, when he was once upon a time going from Gaul by maritime journey into Italy, according to the narrative of Peter Melara of Bologna, a very brave knight and at the

* For the scholarly translation of Aldrovandi, I am indebted to Mrs. S. P. Ravenel, and to Miss Julia Dameron, associate professor of Latin in the College. Miss Dameron has also been so kind as to help me with a number of the other Latin articles herein referred to.

same time a very learned man, was delayed by a very small fish in the midst of its course" *.

The reference made to this same incident by John Johnston, in his book 'A History of the Wonderful Things in Nature,' London, 1657, on page 301, is probably taken from Aldrovandi.

At Geneva, in 1614, Bartholomew Keckermann published his works, and in his 'Disputationes Physicæ' he discusses the ship-staying power of the Remora. He adds nothing to our knowledge of the myth, but does offer an interesting explanation, which will be considered later.

We next come to Rochefort, whose interesting and instructive book on the Antilles was published at Rotterdam in 1665, who says that certain fish bear the name Remora "because they adhere to vessels as if they wished to arrest them in their course." Note the clause "as if they wished." The old order is passing away, men are beginning to seek a rational explanation of the retardation of ships, and doubt is being cast on the efficacy of the Remora as the agent.

So more explicitly writes Du Tertre, whose valuable natural history of the Antilles was published but two years (1667) after Rochefort's work. In the course of his description of the Remora and explanation of its activity, he writes:—

"For myself I hesitate to submit my judgment to that which some authors assure us concerning the Remora, saying that it brings to a full stop a ship which sails before the wind with canvas stretched on a full sea. Since there is so great a quantity of Remoras around the Western Isles, one could scarcely find a ship that would not have several attached to her, yet nevertheless during the century or more that these islands have been frequented, it has never been noted that a single ship has been thus arrested by the Remoras. This has caused me to think that the two or three vessels, which have been said to have been arrested by the Remoras, have been detained by some miracle or charm, and since at the time some Remoras have been attached to them

* Being unable to do anything whatever with this reference, I referred it to Dr. Lydenberg, who very kindly went into the matter fully. He finds that there was a Peter Melara of Bologna who left certain MSS. which are or were to be found in the "Biblioteca dell' Instituto" of that city. He suggests that Aldrovandi had access to this particular MS. This conjecture is strengthened when one remembers that Aldrovandi lived, wrote, and published his book in Bologna. Note, further, that he prefaces his statement by saying "within the memory of our parents."

in their usual fashion, to these have been falsely attributed the cause of their detention."

It will be shown later how closely Du Tertre came to a true explanation, and it is to be regretted that in substituting one mythical explanation for another he narrowly missed the truth. Therein he was better churchman than naturalist.

Le Maire (1695) writes "Le Sucez [Echeneis] is so called because it attaches itself by sucking. It is in size about equal to a sole. When it attaches itself to the rudder, it retards the vessel, but does not stop it as the Remora is falsely said to do."

In the face of what has just been quoted there is now to be presented from one of the most remote corners of the world another and much later story of the Myth. Faber, in his 'Natural History of the Fishes of Iceland' (1829), gives the following circumstantial account:—

"In Jan Olsen's MS. it may be read [that]: 'In the year 1720, by chance it happened on the strand before Hunevand's-Harde (in Nordisland) with a boat which had been rowed out for the autumn fishery, that when the fishermen wished to return they could not move the boat, although they rowed with all their might. Then there was noticed behind on the rudder a short stumpy fish, blackish-gray in color, which moved itself a little and adhered so solidly to the boat that one could scarcely pull it loose with the hand. It left behind on the boat a mark of its body, and when it was pulled loose the boat went forward. The fishermen burned it on the shore whereby a great stench was produced. This animal appears to have been a Remora, and through this account the matter seems to be confirmed that there are really such living fish which can bring a ship to a standstill.'" Faber then concludes: "The exaggeration of the account being allowed for, it is not to be doubted this was a sucking fish."

There is now to be given the latest and most modern account of retardation by the Remora that has come to light. In 1778 there was published in London, "Translated under the author's inspection," the 'Travels in Dalmatia' of the Abbé Alberto Fortis. The locality, it should be noted in passing, is not very far removed from the countries Greece and Rome, in which the legend originated. In a letter to Signior Marsili, Professor of Botany in the University of Padua, Fortis writes:—"I will finish this letter by relating a fact, to which you may give that degree of faith which you think it merits. You have often read in ancient natu-

ralists, of wonderful things done by the Remora, or Echeneis and not without some surprise will have learnt Pliny's story, who after having told us, on the faith of another, how Anthony was retarded on his voyage by means of this fish, asserts positively, that a ship with Caligula on board and four hundred rowers, was actually stopped by one of these fishes, while the rest of the fleet went on at a great rate. When I read this, I contented myself to shrug my shoulders, without perplexing my brain to find out by what natural processes, or matter of fact, such an opinion could become so generally received, that a man of sense as Pliny certainly was, should affirm it in positive terms. But chance led me to the discovery. We were sailing in a small bark between Vruillia and Almissa with a fresh equal gale, in the afternoon. The mariners were all at rest, and the steersman only was awake, and attended alone in silence to the direction of the bark; when, on a sudden, we heard him call aloud to one of his companions, ordering him to come and kill the Paklara. Our learned friend Signior Guilio Bajamonti was with me, and understanding what the man meant, desired him to show him the fish that he wanted killed, but the fish was gone. Having interrogated the steersman, who did not want sense, and was a fisherman by profession, why he had ordered the Paklara killed, and what harm it had done; he answered, without hesitation, that the Paklara used to take hold of the rudder with his teeth, and retarded the course of the bark so sensibly, that not only he, but every man who sat at the helm felt it there without seeing it. He added, that many a time he himself had catched the Paklara in the act and had frequently killed and eat it. That it was often met with in the waters of Lissa. That in shape it resembled a conger eel, and in length did not usually exceed a foot and a half. That if I had a mind to see, and catch one of them I needed only to go in a fishing boat, in the warm season, between the islands of Lessina and Lissa, where he had never failed to meet with them every year. I will not desire you to believe everything my pilot said; but confess that I should be very glad to see the Paklara when it had taken hold of the rudder of the bark under sail. The wonderful strength of the muscles of some little marine animals, such as the *Lepades,* that so obstinately resist any attempts to disengage them from their rocks, the stroke proceeding with such rapidity from the Torpedo, known at Venice by the name of *pesce tremolo* and in the sea of Dalmatia by that of Trnak; the vigor shewn by the *Dentici* in their convulsive motions even when out of their own element, not to mention

the larger fish, such as, Tunny, Dolphins, etc., give me ground to suspect, that if all that the ancients wrote concerning the Remora be not just literally true, it is not altogether false. It certainly is a thing worthy of some reflection, that Pliny speaks so diffusely concerning this phenomenon, as a known fact that could not be called in question. The Greeks adopted the notion of this extravagant faculty, by superstitiously hanging the Remora about women with child, to prevent abortion. I am not, however, so ready to credit these extravagances or in the least persuaded of the wonderful retarding force of this little fish; and think it sufficient to believe that the force of the Paklara may be felt at the rudder of a small bark, without troubling myself further about the Remora.

"The Remora of the ancients, and the Paklara of our days, have this remarkable difference, that the first is almost always of the testaceous kind, and the second is of the genus Murena."

From this we see that the Abbé was half convinced of the correctness of the sailor's belief as to the power of the Paklara. However, he thinks this fish to be a lamprey eel, while the Remora of Pliny is in his opinion a shellfish. This is confirmed by a further reference on page 325, which reads as follows:—"Among the curious fishes found in those waters [of Lissa] the Paklara is the most remarkable: I did not see it, but the description given me by the fishermen, agrees with the Echeneis of Artedi, and Gouan, though, in my opinion, not with the Echeneis or Remora of the ancients."

Before going into an explanation of the Myth of the Ship-holder, it may be of interest to show that the term Remora has attained a place in literature. Among the Romans we find Lucilius saying "A certain voice sounding forth made for you a Remora in your progress." Again, Plautus says "Those things are distasteful which obstruct many undertakings and they make for a Remora both in public and private affairs." However, since the word Remora is a common Latin term for a delayer or retarder, we cannot be sure that its use above is a reference to the fish; more probably it is a use of the term in its original and ordinary sense.

Probably not such, however, is the use of the term by St. Basil (329–379). He affirms that "Life is a voyage and in our life's ways, countries, courts, towns, and rocks are remoras."

In English literature, however, more direct allusions are

to be found. Thus Spenser, in his 'Visions of the World's Vanity,' i. p. 108, writes:—

"Looking far forth into the ocean wide,
A goodly ship, with banners bravely dight,
. . . . . .
Through the main sea making her merrie flight.
. . . . . .
All suddenly there clave unto her keel
A little fish that men call Remora,
Which stopt her course, and held her by the heel,
That wind nor tide could move her thence away."

And Ben Jonson says ('Poetaster, III. 1):—

"I say a remora,
For it will stay a ship that's under sail."

And again, in his Act III. Scene 1, he makes Horace say to Fuscus Aristius of Crispinus, a great bore, who had nearly talked him to death:—

"Aristius. What ails't thou man?
Horace. 'Death, I am seized on here,
By a land remora: I cannot stir,
Nor move but as he pleases."

Maundrell, in his 'Aleppo to Jerusalem' (p. 46) writes:—"We had his promise to stay for us, but the remoras and disappointments we met with in the Road had put us backward in our journey."

And again, Jeremy-Taylor quaintly says:—"A gentle answer is an excellent remora to the progresses of anger, whether in thyself or others."

Before leaving this part of the subject, the following story may be added as of interest. In David Livingstone's 'Missionary Travels and Researches in South Africa' (New York, 1858), on page 556, in writing of the Barotse valley on the Leeba River, one of the headwaters of the Zambesi, he says:—"The Barotse [people or tribe] believe that at certain parts of the river a tremendous monster lies hid and that it will catch a canoe, and hold it fast and motionless, in spite of the utmost exertions of the paddlers."

In the Indian Ocean around Zanzibar the Remora abounds in great numbers, and is used, as I shall show in another paper, for the purpose of catching turtles by virtue of its propensity for clamping itself fast to any floating object. At first I was inclined to think that the Barotse myth was a

far distant echo of the Zanzibar stories; but Livingstone shows very conclusively that the inhabitants of the upper Zambesi *in his day* had no communication whatever with the coast. Such communication may have existed at an earlier day, and at that time the story may have been brought inland, or it may have arisen spontaneously. At any rate, it is very curious and is worth repeating in this connection.

The Myth explained.

First Explanation: Foul Bottoms.

In giving the explanations of the Myth of the Ship-holder, it seems best to take them up chronologically, for, as might be expected, even in ancient days there were men whose minds sought a rational explanation.

The first person who attempted to clear up this matter seems, so far as can be found, to have been Plutarch (46 A.D.). On page 277 his account of the statement of Chæremonianus the Thrallian has been given, and it will be recalled that the latter was laughed at for believing such an extraordinary thing. However, Plutarch, entering into the conversation, said :—

"Therefore as those things mentioned are but consequences to the effect, though proceeding from one and the same cause, so one and the same cause stops the ship, and joins the Echeneis to it; for the ship continuing dry, not yet made heavy by the moisture soaking into the wood it is probably that it glides lightly, and as long as it is clean, easily cuts the waves; but when it is thoroughly soaked, when weeds, ooze, and filth stick to its sides, the stroke of the ship is obtuse and weak; and the water coming upon this clammy matter, doth not so easily part from it; and this is the reason why they usually scrape the sides of their ships. Now it is likely that the Echeneis in this case, sticking upon the clammy matter, is not thought an accidental consequence to this cause, but the very cause itself."

Now it must be conceded that this is a reasonable explanation, and we will find that until the middle of the sixteenth century it was repeated as explanatory of ship-retardation.

Gesner (1558) quotes Plutarch at length, insists on the retarding effect of mosses and algæ ("multa alga & musco innascete"), and plainly shows that he regards these (among which the Echeneis is found) as an efficient cause in the slowing up of the speed of ships rather than the action

of the fish itself, although nowhere he expresses a disbelief in this power of the Echeneis.

Lævinus Lemnius * (1559), in discoursing of "Sea-weed and Sea Fucus," apparently only amplifies Plutarch when he says :—

"But Mosse must be held to be a thing different from these: one kind whereof grows not only on the shores, but upon the sterns of the ships, when they come home from long voyages, to which not only Mosse and Sea-weeds, but shell-fish and a little fish called Echeneis stick so fast, that they will stop Ships, and hinder their courses, therefore our men use to rub them off with sharp brushes, and scrape them away with irons that are crooked for the purpose, that the ship being tallowed and careened well and smoothly may sail the faster."

Aldrovandi, Gesner's great successor and copier (1613), devotes several pages of his huge folio to "Occultane an Manifesta Vi Naves Remoretur," most of his data being taken from Gesner. He gives at length Plutarch's explanation of the retardation as due to growths of marine algæ among which the Echeneis clings, thus being "not the cause of the retardation of the ship but an accident of the effecting cause."

Aldrovandi is the last of those who allege the growth of sea-weeds as a cause of the retardation. It began to be seen that, while such marine growths would slow up a ship, they did not explain the remarkable instances of retardation in which the speed of the vessel was checked for a while but which was presently regained. However, another attempt had been made to explain these erratic movements of vessels, and this will now be given.

Second Explanation: The Adhering Remora acts as a Rudder.

This seems to have been first advanced by Rondelet (1558) in these words :—

"Pliny and others are greatly astonished that it is possible for this fish to have the power to stop a moving vessel propelled by sails and oars; but, as Aristotle says, one wonders at many things of which one does not understand the cause . . . . which we will give concerning the effect of

* Lemnius's book 'De Occultis Naturæ Miraculis' was first published at Antwerp in 1559. The above quotation is from the English edition, 'Concerning the Secret Miracles of Nature,' Book III. Chapter 9, pp. 218–219, published at London, 1658.

this fish taken by itself in the place it requires. Because the rudder is small and placed at one end of the boat it is managed by one man who does not exert himself greatly. In the same way it is easy for that which moves one end to move the whole, for as the force and swiftness of those things which are thrown or moved finally ceases, so at the end of a continuous thing in motion the movement is weak and feeble, and because it is weak it is easily disturbed and overcome. As a boat, which is a continuous thing, goes very swiftly when driven by the winds, the first end called the prow goes more rapidly, and the rear end called the stern goes not so rapidly for in this latter place is the rudder which, moved here and there, makes the prow move easily also, for the reason above mentioned, and consequently the vessel as a whole moves. In this way, if a vessel is lightly driven straight ahead, and if the Echeneis or Remora, having put its mouth against the rudder, moves it here and there, it is necessary that this movement through the continuity of the vessel be communicated also to the prow and that it stop in its first course to waver in this direction or that according as the fish moves it ; for it is a thing proved by reason, and certified by experience, that however little one of the ends is moved, the other also and indeed the whole of any continuous body is moved in the same way."

In this Rondelet seems to have taken from Aristotle's treatise on Mechanics the latter's explanation of how a rudder causes a ship to change her course, and to have adapted it as seen above to try to show how the Echeneis causes a ship to change her course and be delayed.

The above is a good translation of Rondelet's old and very difficult French *. In another place, speaking of Oppian's Remora, which he identifies as the lamprey eel, and which is said to stop and hold back vessels, Rondelet affirms that this is "a thing which corresponds to our lamprey and which I have known through experience, for if it puts its mouth against a boat it stops it, and I have seen it thus." Here for the first time we have an eye-witness account of the ship-retarding power of a fish. The lamprey has a round suctorial mouth by which it transports stones to make its "nest" at the breeding-season, and by which it fastens itself to fishes. That it should thus fasten on to a vessel is by no means improbable, nor is it improbable that by violent motions it could slow up the speed of a small boat.

The 'De Subtilitate Rerum, Liber X.' of Jerome Cardan

* For this translation I am indebted to Miss Hinda Hill, head of the Department of French in this College.

seems to have been first published in 1550; however, it was included in his complete works published in 1564 at Lugduni. On page 117 of this edition he has a column devoted to the Remora and its activities. He describes at some length and in bad Latin how the Remora by adhering to the rudder and waving its tail to right and left, turns the ship in first one and then the other direction, thus causing it to waver and lose speed. He compares its action to that of the steersman of a boat, who, using an oar over the stern, influences her course more than all the rowers who are pulling hard.

Gesner (1558) quotes Rondelet at length, but somewhat simplifies the explanation of the latter, saying that when the Echeneis affixes itself to the stern or rudder, and when it moves body or tail it causes the vessel to stand still, or, at any rate, to waver in its course, "just as when in a calm the helmsman turns the ship in her prosperous and swift course over to a more inexperienced steersman who is not able to hold the tiller straight," and hence the ship has a wavering movement and does not make good progress.

Imperato (1599), who, as previously noted, was the first to explain how the Remora fastens itself to vessels or fishes, says:—"It has on the upper part of the head tentacles, similar to the vibratile combs [cirri, literally ringlets] of the polyps, by which it attaches itself to ships or to the bodies of whales and other large fishes and retards their course and restrains them at will; not otherwise than the rudder, while projecting but little from the vessel, has the power of directing its course."

The next writer to proffer the explanation we are discussing is Aldrovandi (1613). However, he starts by quoting Aristotle on the use of the rudder in changing the motion of a ship. He then advances the same arguments which we have found in Gesner and which the latter expanded from Rondelet. However, Aldrovandi argues at considerable length and somewhat ingeniously, but the gist of his argument is that the Remora sticking fast to the stern or rudder by moving its tail or body moves this continuous thing, the ship, causing it to hesitate or even pause in its course. It must be said, however, that Aldrovandi's Latin is so imperfect, and hence so hard to translate, that it is hard to say how much of this is Gesner and how much Aldrovandi.

With the rise of the Renaissance, and the freeing of men's minds from many old-time superstitions, it began to be seen that it was an absurd impossibility any longer to think that one small fish could retard, much less cause to come to a

standstill, a large vessel. And so we find Rochefort (1665) remarking (as noted heretofore) that Remoras "adhere to vessels as if they wished to arrest them in their course."

Du Tertre, who was a contemporary of Rochefort, and whose book was published but two years later (1667), had seen a number of Remoras attached to ships in the West Indies, but had never known of a vessel which had been brought to a standstill by them. So he preferred to think that such vessels "had been detained by some miracle or charm."

Third Explanation: Large Numbers of Adhering Remoras.

Dampier, whose 'Voyages' was published in 1697, tells us that he found great numbers of Remoras in the Caribbean Sea and the Gulf of Mexico, and goes on to say with regard to their retarding power:—

"Any knobs or inequalities at a Ships bottom are a great hindrance to the swiftness of its sailing; and 10 or 12 of these [Remoras] sticking to it, must needs retard it, as much in a manner as if its bottom were foul." And in this conclusion Catesby (1754) fully agrees.

Le Maire (1695) remarks that "Le Sucez," if it attaches itself to the rudder, may retard the vessel but cannot stop it, as the old legend falsely had it concerning the Remora. While Leguat (1721) emphatically says that "It is very certain that these fish attach themselves often to vessels in the water, and when the number is sufficiently great, one cannot doubt that they are an obstacle to the course of these floating edifices, since they prevent their easy movement over the waves."

John Barbot (1732) is also very emphatic on this point. Referring to the common notion that the Remora by sticking to a ship can retard it, he says, ". . . . some part whereof might be possible, if a sloop or small vessel had a thousand or more sticking to its sides and stern, they being commonly, at full length, about 3 foot long or better, for then they might considerably retard the sailing of such a vessel; but it is ridiculous to say that they can have any power over great ships under full sail, as is pretended."

In close agreement with Barbot is the great French naturalist Lacépède (1829), who in turn is probably quoting from the naturalist Commerson, from whose manuscripts most of Lacépède's information with regard to foreign fishes seems to have been obtained. After discussing the various

myths concerning the "ship-holder," the French ichthyologist goes on to say :—

"In the midst of these ridiculous suppositions, one truth however stands out; that is that on the instant when the keel of the vessel has adhere to it, so to speak, a great number of echeneises, it would experience in moving through the water a resistance comparable to that which a great number of shelled animals [barnacles?] would make if attached equally on its surface, when it glides with less speed through a fluid which grating on the asperities brings it about that the vessel does not possess the same 'liveliness.' But one does not fail to think that the circumstances under which the echeneises would find themselves thus accumulated [in such numbers] against the timbers and exterior of a ship would be extremely rare in all latitudes."

On this matter Lowe, in his 'Fishes of Madeira' (1843), after reviewing many of the Greek and Roman legends, makes the following conservative statement :—

". . . . there is much doubtless of mere fiction or exaggerated fancy ; yet, on the other hand, it would be rash altogether to deny the truth. Like most popular accounts or vulgar errors, they may probably be founded on some real circumstances, or natural occurrence, distorted by exaggeration into the wonderful. There would be nothing marvelous, that a Lamprey, of even ordinary size, fixed to the keel or rudder of a boat, suspended by one end and struggling in the water should, as related by Rondelet upon his own experience, greatly retard such vessel's progress, render its course unsteady, and baffle the exertions of the rowers.

"Again it is remarkable that the Dalmatians at this day, as Schneider in his note on Aelian, II. 17, mentions on the authority of the Abbé Fortis, possess the same idea regarding a fish they call Paklara, which the ancients held regarding their Echeneis or Remora. So strange a notion is not likely to have originated from communication with others amongst a wild and illiterate population; or, again, to have sprung up spontaneously and independently without some real ground. Without recourse, therefore, to the marvelous or extraordinary on the one hand, or to mere fiction on the other, it does not seem unreasonable to suppose that the accidental attachment to the rudder of a small sized vessel of some fish like Rondelet's Lamprey may have originated an impression, which has subsequently been generalized and transferred to other sucking-fishes, in themselves incapable of producing like effects."

The soundness, the reasonableness of the conclusions reached by the various writers in the immediately preceding pages will appeal to every reader, but it must be remarked that these are all conjectures, not facts observed and recorded by scientific men. However, just here I am fortunate in being able to give the following quotation from one of the most eminent ichthyologists of the present day, Mr. David G. Stead. In his 'Fishes of Australia' (1906), pages 190, 191, we read:—

"Now, though it would be altogether impossible and out of all reason to suppose that one individual [Echeneis] could exert sufficient power to delay or retard a vessel's progress, still an instance has actually come under my notice, in which a sailing-vessel was considerably delayed while in tropical seas through a shoal of 'Suckers' attaching themselves all round its sides and bottom."

Unfortunately, I have had no experience of my own as to the retarding powers of this fish, but in the summer of 1915 I carefully questioned (avoiding all leading queries) one of the most experienced fishermen at Key West, Fla. We had just caught a large shark, and were vainly attempting to hook its sucking-fish attendant, when I related the story of the ship-holder, cast some doubts on it, and asked Griffin what he thought of it. He replied about as follows:—"They sure will hold a boat. I have seen ten or twelve under a boat at one time. This was while king-fish fishing at Bahia Honda. The king-fish were in big schools and were followed by hundreds of sharks. The 'suckers' on the boat came from the sharks. My brother and me had boats just like each other in size and build, but his was a little better sailer than mine. The first day he beat me, both sailing before the wind, but the second day I beat him. He said, 'No wonder I am losing, too many "suckers" hanging on her bottom.' All the Key West fishermen know that 'suckers' will sure hold a boat."

This was corroborated from his own experience by my captain, an educated young Englishman from the Bahamas. And both men agreed that of two fishing-boats of equal size and speed, the one having behind it a "trolling squid" for mackerel will be retarded and will lose in a close race.

In order that the reader may get a clear idea of the "brake" which a good-sized sucking-fish may put on the movements of its host, figure 7 (Pl. XVI.) is introduced just here. This is from a photograph of a model in the United States National Museum of a shark with its adhering Echeneis. The fish is about half the size of the shark—say,

3 feet to the shark's 6. Argument is not needed to establish the idea of a "brake." The figure is from a note by R. I. Geare in 'Scientific American' for 1902. Mr. Geare remarks that the shark often becomes "emaciated from the strain of pulling these uninvited guests around." However, it should be stated that in the figure here given the Echeneis is much larger in proportion to the size of the shark, so far as my experience goes, than is the case ordinarily. Echeneis is known to attain a length of 3 feet. A Remora half that size would be extraordinarily large. On the other hand, however, mention should be made of the fact that, while these semi-parasites are small, not infrequently several may be found on one shark. On a shark taken at Tortugas I found three, while one at Key West was infested with four, the largest about 30 inches long.

Scattered throughout ancient and mediæval literature are a number of more or less isolated explanations of submarine cliffs, of magnetic rocks, and of supernatural and inexplicable forces which held vessels as if anchored. These are widely scattered and little emphasized, and it does not seem worth while to go into them. A fair example is that of Keckermann (1614), who alleges that the Remora sticking to the stern of the vessel pours out a very viscid and cold humour which causes the water around the rudder to be congealed, making the vessel to lose steerage. Again, Johnston (1657) notes that the lodestone has the power of attracting things, and thinks that the Remora has some such non-understandable power.

Fourth Explanation: "Dead-Water."

From the foregoing accounts no one can doubt that a school of Remoras attaching themselves to a small vessel can seriously arrest it in its course, but that they could noticeably retard a large sailing-vessel or a steamer is absurd. However, there is not lacking evidence from the days of Pliny to the present time that large sailing-craft and in our times even steamboats have been mysteriously checked in their courses and even stopped almost or quite still. These being facts, it is necessary to find an explanation for them. This is to be found in the "Dead-Water" of sailors.

The phenomenon of "Dead-Water," in which a sailing-vessel loses velocity and in a light wind may even come to a stop, and in which even a steamer may be retarded, has long been known to seamen. Probably the earliest notice of this is to be found in Chapter X. of the 'Agricola' of Tacitus, where,

in speaking of the geography of Britain, he says :—"Thule [Norway?] was also seen, previously hidden by snow and winter; but the sea is said to be *tough* and hard for the rowers and to be little stirred by winds."

Nansen, in his Norwegian North Polar Expedition (1893–1896), repeatedly noticed this phenomenon. On his return he turned over this problem to V. Walfrid Ekman for explanation. Ekman's paper may be found in the 'Scientific Results' of the expedition, volume v. (1904), and from it the following interesting data are taken.

In order to ascertain the prevalence of this phenomenon, Ekman published appeals for information in thirty-six foreign and in all available Scandinavian newspapers. From the former he received nine answers citing the appearance of "dead-water" in ten different localities, while from Scandinavian waters no less than thirty-two regions are reported to abound in this phenomenon. From this data Ekman concludes that ". . . . From some reason or other it (dead-water) is comparatively seldom met with beyond Scandinavia or appears in a less decided manner than in the Norwegian Fjords."

Foreign reports give dead-water as occurring off Taimur Island on the coast of northern Silesia, also in Kara Sea and Bay in the same region, on the Murman coast of north-west Russia, as very "troublesome . . . . . off the great river mouths of South America," while off the mouth of the Orinoco a ship had to anchor to prevent drifting out of her course. This phenomenon is reported from the Gulf of Mexico and it has been experienced off the Baffin Bay coast of Labrador, while the Saint Lawrence mouth is designated by one Norwegian captain as one of the worst regions in the world for dead-water. Two circumstantial accounts are cited for this phenomenon off the mouth of Fraser River and another near Vancouver Island, in which localities it bears the familiar name used by Ekman. There are two reports of its occurrence in the mouth of the Congo, one for the mouth of the Loire River, and two for the Garonne River and the basin of Arcachon near Bordeaux.

These last instances, however, are not of such pronounced dead-water as in the following report of its occurrence not merely in the Mediterranean but between the island of Cerigo and the southern part of Greece. This very circumstantial account is, because of its pertinence to the Myth, given *verbatim* :—

"On January 2, 1858, we were between Cape Matapan and Cerigo and sailed eastward for the Archipelago. The

wind was W.N.W., a gentle breeze and water quite smooth. We had all sails set and made about $3\frac{1}{2}$ knots. At 10 A.M., when we were about 12 naut. miles S.W. of Cerigo, the brig no longer answered her helm and began to go up northward to the wind. We worked the helm but to no avail. We backed the yards and shivered the braces and made all conceivable manœuvres, but the ship only turned a little and went back again. The little wind we had, seemed to be the same as before, and there were many ships in company both to port and starboard of us, which sailed away, whilst we were lying as if at anchor. Yet there was one sail about 3 miles to port of us in the same predicament.

"In this manner we lay for $1\frac{3}{4}$ hours, when the ship began to glide and fall to leeward a little. We then got the head sails filled and had the aftersails shivering, and without any command of the helm the vessel got down into its course. The most remarkable thing was, however, that when I stood afore, I saw a long stripe stretching from the bow far over the water on each side dividing the water into two parts. The water around the ship was light gray, but ahead of the stripe it was wholly dark. These stripes seemed by and by to move aft . . . . of course it was the ship that began to glide slowly onward . . . . and after 5 or 6 minutes when the stripes had passed along the ship and had left the stern and the rudder, then, at that same moment, the ship again answered her helm and made head-way. The wind was about the same—W.N.W. by W. a gentle breeze. We made 3 knots, but no more, in the afternoon.

"When we approached Cerigo, the ship was about to get into dead-water again, but by working the rudder to and fro, we steered again, and after that, we did not feel the dead-water any more.

"The ship, during its long voyage, had become very dirty and overgrown with barnacles of 10 or 15 cm. in length, which may have had some effect."

From Ekman's quotations from his correspondents as to the occurrence of dead-water around Scandinavia, the following short excerpts are taken. In perusing them the reader is asked to bear in mind the very words of the quotations concerning the actions of ships found in the first section of this paper.

The 'Fram' being in dead-water off Taimur Island . . . . "It may therefore be supposed that the speed was reduced to about a fifth of what it would otherwise have been": and when steam was cut off at 100–150 metres from the buoy, the speed was so reduced that the engine had to be

started to reach it. "Sailing vessels may . . . be seen stuck fast in spite of a breeze brisk enough to keep the sails fully strained . . . . . Sometimes it happened that one vessel gets into dead-water and another not, though it is impossible to discover any reason for this." ". . . . . we already had good speed, when all at once the ship took dead-water . . . . she stopped so quickly that it looked as if she had dropped anchor." The vessels being becalmed, "One of them was towed away without any difficulty, while the other, though of similar size, got into dead-water, and an extraordinary amount of work was required to get this vessel from the spot." Another ship in dead-water drifted back four miles with the current "against the direction of the steady fresh breeze, although they had all sails set." Another observer writes that in dead-water it ". . . . feels as if something were fastened to the ship and holding it back." "In such cases, one or more vessels might suddenly lose their steering and remain on the spot, while others pass freely through the midst of them at a distance as short as two or three ships' length. After a while it was the turn of the other vessels to get into dead-water." "We scarcely glided along and were forced to have all sails set, until we were quite near our anchorage. Then the dead-water suddenly let go its hold. Believe me, they were both in a hurry, the ship and the pilot. Braces and falls ran a race together, and we only just got the anchor dropped without any misfortune." "The brig got into dead-water. . . . . The speed was lost, and the ship was as if nailed to the spot." When the dead-water let go with the sails drawing, ". . . . it all at once appeared as if the vessel had cut loose from a mooring aft." An 8-knot steamer in dead-water ". . . . according to the pilot's own phrase, hardly moved from the spot."

Other descriptions might be quoted, but, save the one now to follow, these are the most typical. The one now to to be given, with a sketch showing the appearance of the water around the vessel, is from the pen of Kommandor-kaptein Joh. Kroepelien of the Norwegian Navy. He writes that the ship with all sails set, heeling over rather stiffly before a fresh breeze ". . . . . all of a sudden, lost her headway without any perceptible external cause, and the turning power of the rudder became nil.

"We then perceived that the ship had taken dead-water. From about amidships and outwards on both sides and to a considerable distance aft she was surrounded by a mass of dead-water, smooth as glass, as if the surface were covered with oil. The line between this smooth surface and the

water farther out, looked like boiling 'rips' and was quite distinct, the outer surface being strongly rippled by the breeze. The roar caused by the dead mass of water which, clinging to the ship, was dragged along through the water outside, was so loud that it might well have been deemed we were in the vicinity of a rapid. I do not remember the appearance of the wake, nor, I believe, was there anything remarkable about it. The rudder was of no use; we were forced to handle the ship by means of the sails and our two boats towing from the bow, and thus we proceeded at a speed of one or two knots.

"In this manner we went on for a couple of hours. All of a sudden, without any known cause, we were set free from the dead-water. The wind had been very steady the whole time, and we had constantly endeavored to keep the ship in the same course. After being freed from the dead-water the ship got headway, and after a while we logged 7 knots, going close to the wind."

Captain Kroepelien's sketch is reproduced herein as fig. 8 (Pl. XVII.). Concerning such an appearance as is here shown, Ekman writes: "As the boundary waves (to be described and explained later) follow the vessel, their wave crests and wave hollows remain in an invariable position relative to the vessel. If the wave motion gives to the water at a particular spot a velocity with the vessel, it would appear as though a bulk of water were being dragged along with her, although it is really always a new mass of water which follows the vessel for a short distance. It is exactly analogous to a boat sailing before the wind with just the same speed as the breaking waves at her side. In the case of dead-water, on the other hand, the illusion will be more complete, because the vessel moves at a slow velocity, and the waves causing the motion of the water are themselves not visible."

In perusing the foregoing accounts, the reader cannot have failed to be struck by the capriciousness of the phenomenon of dead-water, its sudden and seemingly inexplicable appearance, its equally sudden and mysterious disappearance. It may cause a ship gradually to lose speed, or suddenly to be stopped still as if "nailed," "moored," or "anchored" to the spot. The ship may gradually regain her speed or may suddenly speed away "as if a mooring had been cut." Again, a ship may fall into dead-water while a near neighbour but a few cable lengths away may sail on her course without "let or hindrance."

The instances just quoted, closely, almost precisely, parallel

the accounts from the old writers given in the first part of this paper, and there can be no doubt that their phenomena were *bona fide* occurrences of dead-water. One cannot wonder then that when a ship was thus checked and an Echeneis found, as it was not unlikely to be, sticking to rudder or hull, that the fish was deemed the cause of the checking of the speed of the vessel, and that the myth grew and became widespread.

Thus far we have been occupied with Ekman's accounts of dead-water, now let us consider his explanation of this strange phenomenon. After a study of some 42 accounts and descriptions, foreign and domestic, he generalizes as follows : " . . . . . I conclude that dead-water may occur in every place where fresh water flows out over the sea, but that for some reason or other it is comparatively seldom met with beyond Scandanavia or appears in a less decided manner than in the Norwegian fjords. . . . . Dead-water only appears near to coasts, in those places where a suitable layer of fresh or brackish water rests upon the heavier sea-water. A vessel, moving in such a place at slight or moderate speed, may happen to feel the influence of this phenomenon ; it is then said that the vessel has ' taken dead-water,' or ' got into dead-water.' It is a very troublesome matter indeed. A sailing vessel in this plight generally refuses to answer her helm and becomes unmanageable ; steamers, at times sailing vessels also, keep their steerage, but nevertheless the dead-water is a great hindrance, causing the ship to lose her speed almost entirely. The ' Fram,' for instance, so generally capable of making 4·5 knots along the Siberian coast when heavily loaded, had her speed reduced to about one knot in dead-water."

Dead-water then appears to be due to a layer of fresh or brackish water resting upon the heavier sea-water. The greater the difference between the densities of the two layers of water, the stronger of the dead-water. A vessel sailing into such an area loses " way," refuses to obey her helm, and becomes unmanageable ; even steamers have difficulty in maintaining speed, slow ones being greatly checked and at times brought almost to a standstill, while sailing-vessels may be completely stopped. This appears to be due to the fact that " . . . . the vessel when moving at slow speeds generated large waves in the salt-water fresh-water boundary, and the resistance of these speeds was anomalously increased. At higher speeds, however, the waves disappeared and the resistance was not affected by the fresh-water layer."

Ekman tried many experiments in a large glass tank con-

taining a heavy bottom layer of salt water coloured with India ink, having on top of it an uncoloured layer of lighter fresh water. Through this fresh-water layer he towed with a constant or steadily increasing force a small boat model, and studied and even photographed the boundary waves set up in the fresh-water salt-water boundary. He likewise worked out the numerical results in a long series of extended and complex mathematical equations, and as a result of his experiments and calculations he states that : "It is proved by the theoretical and experimental investigation above, that a vessel moving in such a place creates waves in the boundary between the two water layers, and, that on this account, very marked effects on the speed of the vessel will occur ; and it will be shown below that from the existence of such waves all essential effects and peculiarities of the dead-water phenomenon can be very simply explained . . . . . it will, in addition, be shown that the resistance and speed reduction due to the wave generation is of just the proper order of magnitude to explain the effects of dead-water ; so that the correctness of the explanation may be regarded as completely substantiated" *.

Fig. 9 (Pl. XVII.) is copied from Ekman's photographs showing how the retarding boundary wave is created and how it affects the vessel. Of these photographs Ekman himself writes ; "The most important point, which the photographs described above clearly show is that the waves largely increase in height when the velocity of the boat increased toward the critical velocity, but when this is passed, and the boat is free from dead-water, the waves disappear." In this connection it should be noted that in (Ekman's) figures A, B, C, the boat is in dead-water with boundary waves steadily increasing in size. In D, however, the velocity of the boat has increased beyond the critical velocity and the boundary waves have disappeared . . . . the boat is free from or without dead-water.

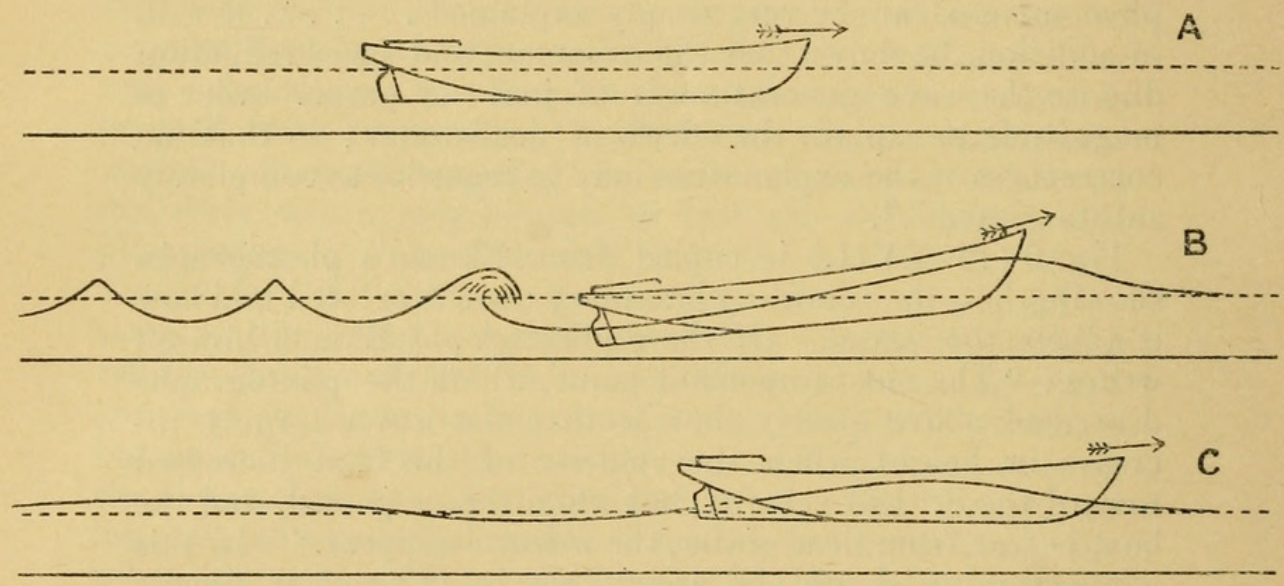
Fig. 10 (p. 304) is copied from Ekman from Scott-Russell (a distinguished English engineer of the middle of the last century) to show the effects of towing a boat in shallow water. Ekman uses it to explain the action of the boundary waves in dead-water. "At the lower velocity, the boat pushes a mass of water before her stem, and at her stern she provokes a wave-hollow ; her resistance is in consequence increased

* B. Helland-Hansen, in Sir John Murray and Dr. Johann Hjort's 'The Depths of the Sea' (1912), corroborated Ekman's conclusions, and, calling this wave a "boundary wave," says that it "may stop a ship so that it lies in dead-water hardly able to move at all."

just as if she constantly had to rise on an incline. She is then 'in dead-water.'" At the higher velocity on the other hand, the boat moves on top of a low hillock of water, which she provokes, and she consequently moves on a nearly horizontal surface, and meets with little resistance.

As to the *modus operandi* by which a vessel in dead-water regains her speed, Ekman takes the case of a sailing-vessel which has taken dead-water because of a drop in the wind. "If the wind now recovers its initial strength, the only effect is that the vessel has her velocity increased a little . . . . . , but she still lies in dead-water and consumes her energy of propulsion upon large boundary waves. Only if the wind freshens still more, so that the propelling force

Fig. 10.



Diagrams from Scott-Russell, after Ekman.

A, boat towed at low speed, no disturbance and no marked resistance; B, at the critical speed, boat tending constantly to rise on the "solitary wave" and meeting with great resistance; C, boat's speed exceeds the critical velocity, boat rides on top of solitary wave and meets with no resistance.

gets the better of the maximum resistance . . . . , is her velocity at once increased . . . . ; and the large boundary waves simultaneously disappear . . . . the vessel has got free from the dead-water."

One other explanation and we have finished with Ekman. It has been noted repeatedly that vessels in dead-water refuse to obey the helm. If now one turns to Capt. Kroepelien's account and to Ekman's interpretation given on page 301, the explanation is apparent. Boat, rudder, and the surface

layer of fresh water are all moving forward at the same rate. Little, if any, of the rudder reaches down into the underlying salt water, and hence the vessel loses steerage.

There is little else to be said concerning Ekman's claim to have explained dead-water. He had done so in a wonderfully clear and explicit manner. In his paper he refers to the Myth of the Echeneis, and notes that the phenomenon of dead-water effectually clears it up. So it does, and another myth of the ancients is dissipated in thin air under the searching investigation of modern science.

Bibliography.

Aelianus. 200 a.d. 'De Natura Animalium, Libri XVII.': Book I., Chapter 36; Book II., Chapter 17. Edited (in Latin) by J. C. Schneider.

Aldrovandi, Ulyssis. 1613. 'De Piscibus et de Cetis,' pp. 335–340. Bononiæ.

Ambrose, Saint. 'Hexameron, Libri Sex,' Book V., paragraph 24. (Basiliæ, 1566.)

Anglicus, Bartholomew. 1491. 'De Proprietatibus Rebus.' Winchester. John Trevisa, Translator.

Aristotle. 'Historia Animalium' (vol. iv. of complete works, Oxford, 1910). Book II., 14, 505 *b*, 19-22; Book V., 31, 557 *a*, 31. Translated by D'Arcy W. Thompson.

Barbot, John. 1732. 'A Description of the Coasts of South Guinea,' Book III., Chapter XVI., p. 227, of "A Description of the Coasts of North and South Guinea" in Six Books in vol. v. of Churchill's 'Collection of Voyages and Travels.' London.

Basil, Saint. (329–379.) 'Hexameron,' Homily VII., paragraph 56.

Cardan, Jerome. 1564. 'De Subtilitate, Liber Decem'; Operum, p. 117. Lugduni.

Catesby, Mark. 1754. 'The Natural History of Carolina, Florida, and the Bahama Islands,' vol. ii. London.

Cuba, Johann von. 1536. 'Hortus Sanitatis,' Caput 34, p. 78.

Dampier, William. 1729. 'A New Voyage Around the World,' pp. 63-64. Vol. II. of Dampier's 'Voyages.'

Du Tertre, R. P. 1667. 'Histoire Générale des Antilles'; Tome II., L'Histoire Naturelle, pp. 222–223. Paris.

Ekman, V. Walfrid. 1904. 'On Dead-Water,' paper no. XV. of the Norwegian North Polar Expedition, 1893–1896 in Vol. V. Scientific Results edited by Fridtjof Nansen. Christiania.

Faber, Friedrich. 1829. 'Naturgeschichte der Fische Islands,' p. 116. Frankfurt-a.-M.

Forskäl, Peter. 1775. 'Descriptiones Animalium—Piscium—quæ in Itinere Orientale Observavit,' p. xiv. Edited by Carsten Niebuhr. Hauniæ.

Fortis, Abbé Alberto. 1778. 'Travels in Dalmatia,' pp. 260–263, 325. London.

Frascatorius, Hieronymous. 1550. 'Liber I. De Sympathia et Antipathia Rerum,' etc., p. 24. Lugduni.

Gesner, Konrad von. 1558. 'Historia Animalium,' Book IIII., pp. 410–415. Basel.

Gill, Theodore. 1863. 'Remarks on the Relations of the Genera and other Groups of Cuban Fishes.' Proceedings Academy of Natural Sciences, Philadelphia, vol. xiv. pp. 239–240.

Günther, Albert C. L. 1860. "On the History of Echeneis." Annals and Magazine of Natural History, ser. 3, vol. v. pp. 386–402.

Hasselquist, Friedrich. 1762. 'Reise nach Palaestina in den Jahren 1749 bis 1752,' p. 373. Translated by Carl Linnæus.

Imperato, Ferrante. 1599. 'Historia Naturale,' p. 697. Venetia.

Johnston, John. 1657. 'A History of the Wonderful Things in Nature Set Forth in Ten Several Classes,' p. 301. London.

Jorath. *See* Achandes, p. 71 of Von Cuba's 'Hortus Sanitatis.'

Keckermann, Bartholomew. 1614. 'Disputationes Physicæ in Operum Omnium Quæ Extant,' Tomus I., column 2006. Geneva.

Lacépède, B. G. E. (M. A. Desmarest, Editeur.) 1829. 'Histoire Naturelle des Poissons,' tome III. pp. 478–490. Paris.

Leguat, Francis. 1721. 'Voyages et Aventures,' vol. i. pp. 122–123. Londres.

Le Maire, Sieur de. 1695. 'Les Voyages aux Iles Canaries; Cap-Verd, Senegal et Gambie,' pp. 116–117. Paris.

Lemnius, Lævinus. 1658. 'Concerning the Secret Miracles of Nature,' Book III., Chapter 9, pp. 218–219. London.

Linschoten, Jan Huygen van. 1598. 'Discourse of Voyages into ye Easte and West Indies,' pp. 89–90. London.

Livingstone, David. 1858. 'Missionary Travels and Researches in South Africa,' p. 556. New York.

Lonicer, Adam. 1551. 'Naturalis Historiæ, Opus Novum in Quo Tractatur de Natura,' etc. Frankfurt.

Lowe, Richard Thomas. 1843. 'A History of the Fishes of Madeira' (No. III.), pp. 77–81. London.

Massari, Francisco. 1537. 'Annotationes,' cap. 25, pp. 152–156. Basiliæ.

Melara, Peter. "Liber De Cardinalibus," folio 99, MS.

Oppian. 200 A.D. 'Halieutica,' Book I., line 223 *et seq.* Translated by John Jones, Oxford, 1722.

Ovid. 'Halieutica,' verse 99.

Pliny the Second. 'Natural History,' Book IX., Chapter 41; Book 32, Chapter 1. Translated by John Bostock and H. T. Riley. London.

Plutarch. 'Miscellanies—Symposiacs,' Book II., question 7. Edited by A. H. Clough and W. W. Goodwin.

Rabelais, François. 1553. 'Pantagruel,' Book IV., Chapter 62 Book V., Chapter 29.

Rochefort, C. De. 1665. 'Histoire Naturelle des Iles Antilles de l'Amérique,' pp. 193–194. Rotterdam.

Romano, Bartolomeo Crescentio. 1607. 'Nautica Mediterranea.' Rome.

Rondelet, Guillaume. 1558. 'L'Histoire Entière des Poissons,' pp. 313 and 334–335. Lion.

Stead, David G. 1906. 'Fishes of Australia,' pp. 190–191. Sydney.

Wotton, Edward. 1552. 'De Differentiis Animalium, Libri Decem,' p. 149. Lutetiæ Parisiorum.

EXPLANATION OF THE PLATES.

Plate XV.

Fig. 1. Sucking-disk of Remora. After Jordan and Evermann, 1900.
Fig. 2. *Leptecheneis naucrates.* After Jordan and Evermann, 1900.
Fig. 3. *Remora brachyptera.* After Jordan and Evermann, 1900.
Fig. 4. Echeneises adhering to a vessel. After von Cuba, 1536.

Plate XVI.

Fig. 5. Imperato's "Echenei, sev Remora," 1599, the earliest-known figure of scientific value.
Fig. 6. Aldrovandi's Remora, 1613.
Fig. 7. Sucking-fish attached to a shark. After Geare. Courtesy of 'Scientific American.'

Plate XVII.

Fig. 8. Kommandorkaptein Kroepelien's sketch of a vessel in "Dead-Water." After Ekman.
Fig. 9. Photographs (from the side) of 'Fram' model in experimental tank; fresh water coloured light, salt water dark. A, B, and C in dead-water with the towing-force gradually increasing; D at high speed, without dead-water.

XXX.—*The Ungual Phalanges termed* Mylodon australis *by Krefft,* Spelæan Animal vel Thylacoleo *by Owen, and* Thylacoleo *by Lydekker.*

By R. Etheridge, Jnr., Director and Curator of the Australian Museum, Sydney, New South Wales.

[Plates XVIII.–XX.]

I. The Ungual Phalanges (*Mylodon australis*) of Krefft.

When a name has crept into print and is in the course of time practically forgotten, or overlooked, as the case may be, it is only fair to the author thereof to resuscitate it, if found to be stable and of value. On the other hand, if established under a misconception, and found to be of no value, it were better relegated to the limbo of synonymy, or the society of abolished names.

There are several such names in the early annals of Australian Palæontology, and in the present paper I purpose dealing with the name *Mylodon australis*, Krefft, and the objects it represents.