

left, continuous with the wall of the tubular branches of the gland (fig. 124, (5), (6), *g*). In no Lamellibranch is there a divergence from this structure, excepting that in some (*Ostrea*) the contiguous nephridial and the genital aperture are sunk in a urino-genital groove, which in other cases (*Spondylus*?) may partially close up so as to constitute a single pore for the nephridial and genital ducts. No accessory genital glands are present.

The development of Anodon is remarkable for the curious larval form known as Glochidium (fig. 147). The Glochidium

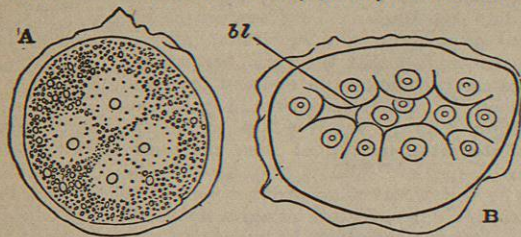


Fig. 148.—Embryos of *Pisidium pusillum* (after Lankester). A. Only four embryonic cells are present, still enclosed in the egg envelope. B. The cells have multiplied and commenced to invaginate, forming a blastopore or orifice of invagination, *bl*.

quits the gill-pouch of its parent and swims by alternate opening and shutting of the valves of its shell, as do adult *Pecten* and *Lima*, trailing at the same time a long

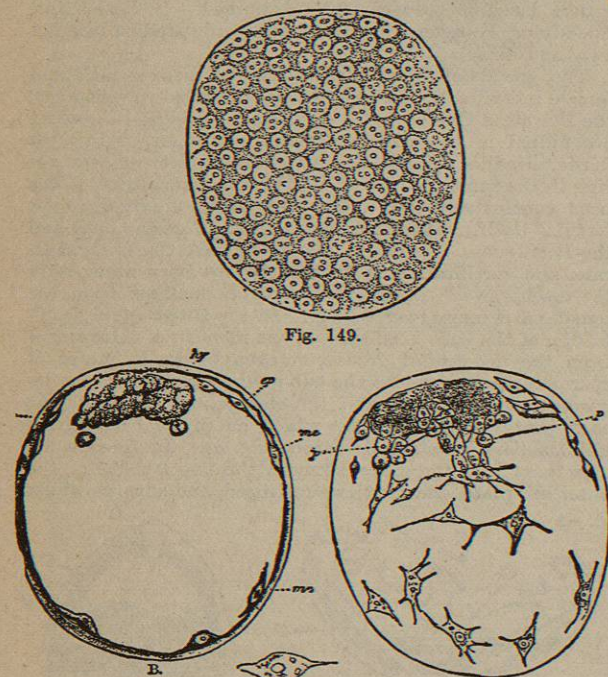


Fig. 149.—Embryo of *Pisidium pusillum* in the diflatus stage, surface view (after Lankester). The embryo has increased in size by accumulation of liquid between the outer and the invaginated cells. The blastopore has closed. Fig. 150.—B. Same embryo as fig. 149, in optical median section, showing the invaginated cells *by* which form the arch-enteron, and the mesoblastic cells *me* which are budded off from the surface of the mass *by*, and apply themselves to the inner surface of the deric or epiblastic cell-layer *ep*. C. The same embryo focused so as to show the mesoblastic cells which immediately underlie the outer cell-layer.

byssus thread. By this it is brought into contact with the fin of a fish, such as Perch, Stickleback, or others, and effects

a hold thereon by means of the toothed edge of its shells. Here it becomes encysted, and is nourished by the exudations of the fish. A distinct development of its internal organs has been traced by the late Professor Balfour, but no one has followed it to the moment at which it drops from the fish's fin and assumes the form of shell characteristic of the parent. Other Lamellibranchs exhibit either a trochophere larva which becomes a Veliger, differing only from the Gastropod's and Pteropod's Veliger in having bilateral shell-calcifications instead of a single central one; or, like Anodon, they may develop within the gill-plates of the mother, though without presenting such a specialized larva as the Glochidium. An example of the former is seen in the

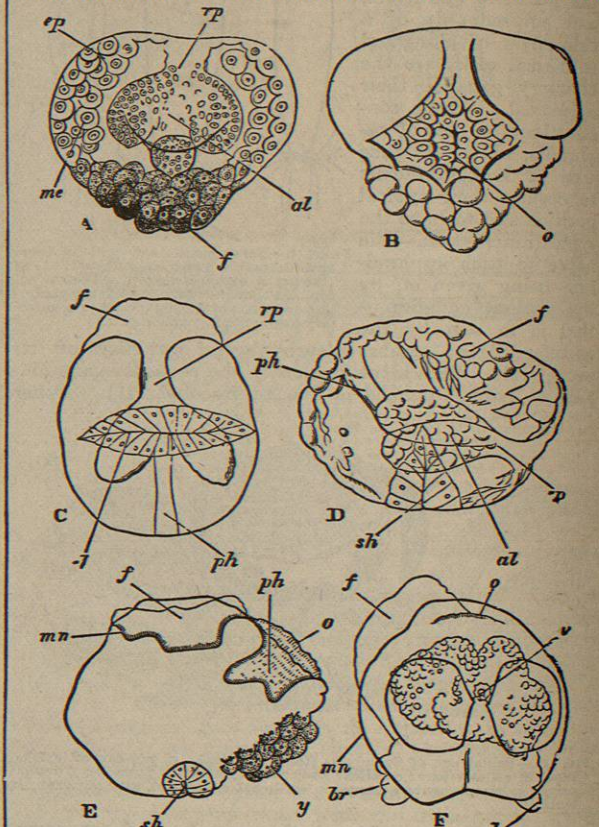


Fig. 151.—Further stages in the development of *Pisidium pusillum* (after Lankester). A. Optical section of an embryo in which the foot has begun to develop. B. The same embryo focused to its surface plane to show the mouth *o*. C. Later embryo, showing the shell-gland *sh*. D. Lateral view of the same embryo. E. Later stage, with rudiments of the mantle-flap, lateral view. F. Still later stage, with shell-valves and branchial filaments. *me*, mesoblast; *al*, met-enteron; *rp*, rectal peduncle or pedicle of invagination connecting the met-enteron with the cicatrix of the blastopore; *o*, mouth; *ph*, pharynx; *sh*, shell-gland; *mn*, mantle-flap; *br*, branchial filaments; *y*, granular cells of doubtful significance; *v*, vesicular structure of unknown significance.

development of the European Oyster, to the figure of which and its explanation the reader is specially referred (fig. 6). An example of the latter is seen in a common little fresh-water bivalve, the *Pisidium pusillum*, which has been studied by Lankester (12). The successive stages of the development of this Lamellibranch are illustrated in the woodcuts figs. 148 to 153 inclusive. These should be compared with the figures of Gastropod development (figs. 3, 4, 5, 7, and 72***). Fig. 148 shows the cleavage of the egg-cell into four (A), and at a later stage the tucking in of some of the cells to form an invaginated series (B).

The embryonic cells continue to divide, and form an oval vesicle containing liquid (fig. 149); within this, at one pole, is seen the mass of invaginated cells (fig. 150, *by*). These invaginated cells are the arch-enteron; they proliferate and give off branching cells, which apply themselves (fig. 150, C) to the inner face of the vesicle, thus forming the meso-

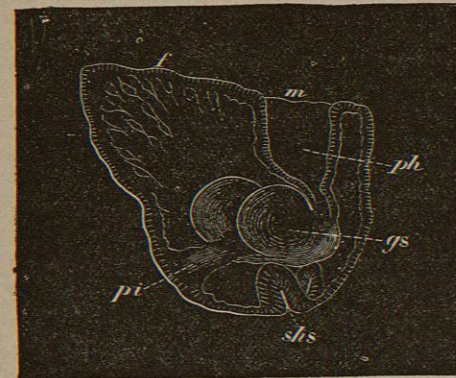


Fig. 152.—Diagram of embryo of *Pisidium* in the same stage as E in fig. 151. *m*, mouth; *f*, foot; *ph*, pharynx; *gs*, met-enteron; *pi*, rectal peduncle or pedicle of invagination; *shs*, shell-gland. (From Lankester.)

blast or coelomic outgrowths. The outer single layer of cells which constitutes the surface of the vesicle (fig. 147) is the ectoderm or epiblast or deric cell-layer. The little mass of hypoblast or enteric cell-mass now enlarges, but remains connected with the cicatrix of the blastopore or orifice of invagination by a stalk, the rectal peduncle (fig. 151, A, *rp*). The enteron itself becomes bilobed and is joined by a new invagination, that of the mouth and stomodæum, *ph*. Fig. 151, B shows the origin of the mouth *o*, being a deeper view of the same specimen in the same position which is drawn in fig. 151, A. The mesoblast multiplies its cells, which become partly muscular and partly skeleto-trophic. Centro-dorsally now appears the embryonic shell-gland (fig. 151, C, *sh*). The pharynx or stomodæum is still small, the foot not yet prominent. A later stage is seen in fig. 152, where the pharynx is widely open and the foot prominent. No ciliated velum or præ-oral (cephalic) lobe ever develops. The shell-gland disappears, the mantle-skirt is raised as a ridge (fig. 151, E, *mn*), the paired shell-valves are secreted, the anus opens by a proctodæal ingrowth into the rectal peduncle, and the rudiments of the gills (*br*) and of the nephridia (B) appear (figs. 151, F, and 153, dorsal and lateral views of same stage), and thus the chief organs and general form of the adult are

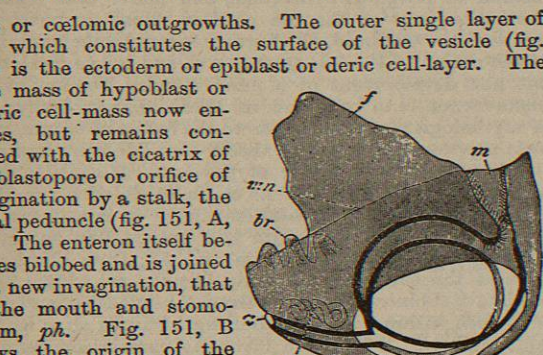


Fig. 153.—Diagram of embryo of *Pisidium*, in same position as F in fig. 151 (after Lankester). *m*, mouth; *z*, anus; *f*, foot; *br*, branchial filaments; *mn*, margin of the mantle-skirt; *B*, organ of Bojanus (nephridium). The unshaded area gives the position of the shell-valve.

MOLLUSCOIDS. See BRACHIOPODA and POLYZOA. MOLOCH, or MOLECH—in Hebrew, with the doubtful exception of 1 Kings xi. 7, always מלך with the article—is the name or title of the divinity which the men of Judah

acquired. Later changes, not drawn here, consist in the growth of the shell-valves over the whole area of the mantle-flaps, and in the multiplication of the gill-filaments and their consolidation to form gill-plates. It is important to note that the gill-filaments are formed one by one posteriorly. The labial tentacles are formed late. In the allied genus *Cyclas*, a byssus gland is formed in the foot and subsequently disappears, but no such gland occurs in *Pisidium*. The nerve-ganglia and the otcysts probably form from thickenings of the epiblast, but detailed observation on this and other points of histogenesis in the Lamellibranchia is still wanting.

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in the last ages of the kingdom were wont to propitiate by the sacrifice of their own children. The phrase employed in speaking of these sacrifices is "to make one's son or daughter pass through fire to the Moloch" (2 Kings xxiii.

10; Jer. xxxii. 35, and so without the words "through fire" Lev. xviii. 21); but it appears from Ezek. xvi. 20, 21 that this phrase denotes a human holocaust,¹ and not, as sometimes has been thought, a mere consecration to Moloch by passing through or between fires, as in the Roman *Patilia* and similar rites elsewhere. Human sacrifices were common in Semitic heathenism, and at least the idea of such sacrifices was not unknown to Israel in early times (Isaac, Jephthah's daughter), though in the sunny days of the nation, when religion was a joyous thing, there is no reason to think that they were actually practised.² It was otherwise in the neighbouring nations, and in particular we learn from 2 Kings iii. 27 that the pious sacrifice of his son and heir was the last offering which the king of Moab made to deliver his country. Even the Hebrew historian ascribes to this act the effect of rousing divine indignation against the invading host of Israel; it is not, therefore, surprising that under the miseries brought on Palestine by the westward march of the Assyrian power, when the old gladness of Israel's faith was swallowed up in a crushing sense of divine anger, the idea of the sacrifice of one's own son, as the most powerful of atoning rites, should have taken hold of those kings of Judah (Ahaz and Manasseh, 2 Kings xvi. 3, xxi. 6) who were otherwise prone, in their hopelessness of help from the old religion (Isa. vii. 12), to seek to strange peoples and their rites. Ahaz's sacrifice of his son (which indeed rests on a somewhat late authority) must have been an isolated act of despair; human sacrifices are not among the corruptions of the popular religion spoken of by Isaiah and Micah. But in the 7th century, when the old worship had sustained rude shocks, and all religion was transformed into servile fear (Micah vi. 1 *sq.* belongs to this period; see MICAH), the example of Manasseh spread to his people; and Jeremiah and Ezekiel make frequent and indignant reference to the "high places" for the sacrifice of children by their parents which rose beneath the very walls of the temple from the gloomy ravine of Hinnom or Tophet³ (Jer. vii. 31, xix., xxxii. 35; Ezek. xvi. 20, xxiii. 37). It is with these sacrifices that the name of "the Moloch" is always connected; sometimes "the Baal" (lord) appears as a synonym. At the same time, the horrid ritual was so closely associated with Jehovah worship (Ezek. xxiii. 39) that Jeremiah more than once finds it necessary to protest that it is not of Jehovah's institution (vii. 31, xix. 5). So too it is the idea of sacrificing the firstborn to Jehovah that is discussed and rejected in Micah vi. It is indeed plain that such a sacrifice—for we have here to do, not with human victims in general, but with the sacrifice of the dearest earthly thing—could only be paid to the supreme deity; and Manasseh and his people never ceased to acknowledge Jehovah as the God of Israel, though they sought to make their worship more efficacious by the adoption of foreign rites. Thus the way in which Jeremiah, and after him

¹ In 2 Chron. xxviii. 3 (parallel to 2 Kings xvi. 3) a single letter is transposed in the phrase, changing the sense from "caused to pass through the fire" to "caused to burn with fire." Geiger (*Urschrift und Uebersetzung*, p. 305) very unnecessarily supposes that this is everywhere the original reading, and has been changed to soften the enormity ascribed to the ancient Hebrews. The phrase "to give one's seed to Moloch," Lev. xx. 2 *sq.*, and the fact that these victims were (like other sacrifices) regarded as food for the deity (Ezek. xvi. 20) explain and justify the common reading.

² In Hosea xiii. 2 the interpretation "they that sacrifice men" is improbable, and 2 Kings xvii. 17 and Lev. xviii., xx. are of too late date to prove the immolation of children to Moloch in old Israel. The "ban" (בְּרִית), which was a religious execution of criminals or enemies, was common to Israel with its heathen neighbours (stone of Mesha), but lacked the distinctive character of a sacrifice in which the victim is the food of the deity, conveyed to him through fire.

³ The etymology of the word Tophet is obscure; its meaning appears from *topheth*, "pyre," Isa. xxx. 33.

the legislation of Leviticus and the author of Kings, seem to mark out the Moloch or Baal as a false god, distinct from Jehovah, is precisely parallel to the way in which Hosea speaks of the golden calves or Baalim. In each case the people thought themselves to be worshipping Jehovah under the title of Moloch or Baal; but the prophet refuses to admit that this is so, because the worship itself is of heathenish origin and character. "The Moloch," in fact, like "the Baal," is not the proper name of a deity, but a honorific title, as appears from the use of the article with it. According to the Hebrew consonants, it might simply be read "the king," which is a common appellation for the supreme deity of a Semitic state or tribe.⁴ And so the LXX., except in 2 Kings xxiii. 10, and perhaps Jer. xxxii. 35, actually treat the name as an appellative ("ruler," "rulers"). The traditional pronunciation, which goes back as far as the LXX. version of Kings (Μολόχ), appears to mean "the kingship"—an unsuitable sense, which lends probability to the conjecture that the old form was simply "the king," and that the later Jews gave it the vowels of מלך, the contemptuous name for Baal (G. Hoffman in *Z. f. A.T.W.*, 1883, p. 124).

From these arguments it would appear that the rise of Moloch worship does not imply the introduction into the religion of Judah of an altogether new deity, but only a heathenish development of Jehovah worship, in the familiar fashion of religious syncretism, and under that sense of the inadequacy of the old popular ritual to divert the wrath of the Godhead which was inspired by the calamities of the nation in the 7th century B.C., and led to more than one new development of atoning ritual. The key to the phenomenon is to be found in Micah vi., not in any vein of mythological speculation as to the forces of nature, such as is supposed in Movers's theory that Moloch represents the fiery destructive power of the sun. Moloch, in fact, in the Old Testament has no more to do with fire than any other deity. The children offered to him were not burned alive; they were slain and burned like any other holocaust (Ezek. *ut supra*; Isa. lvii. 5); their blood was shed at the sanctuary (Jer. xix. 4; Ps. cvi. 38). Thus the late Rabbinical picture of the calf-headed brazen image of Moloch within which children were burned alive is pure fable, and with it falls the favourite comparison between Moloch and the Carthaginian idol from whose brazen children were rolled into an abyss of fire, and whom Diodorus (xix. 14) naturally identifies with the child-eater Kronos, thus leading many moderns to make Moloch the planet Saturn. On the other hand, the Massoretic text of 1 Kings xi. 7 makes Moloch (without the article) the name of the god of the Ammonites, elsewhere called Milcom or Malcam. But in this place the LXX. translators certainly found the longer form מלכמ in their MSS. (as the Hebrew still reads in verse 33), while it is plain from 2 Kings xxiii. 10, 13 that the worship of Milcom at the shrine set up by Solomon was distinct from the much later Moloch worship of Tophet. In the usual printed text of the LXX., indeed, this distinction is not made in 2 Kings xxiii.; but this is an error of the Roman edition, the Vatican MS. really reading MOAXOA in verse 13.

(W. R. S.)

MOLUCCAS, MOLUCCOS, or SPICE ISLANDS, THE, comprise, in the wider use of the term, all the islands of the East Indian Archipelago between Celebes on the west, the Papuan Islands and New Guinea on the east, Timor on the south, and the open Pacific on the north. They are

⁴ Compare the Tyrian Melkart (king of the city) and the two names compounded with *melch*, "king," in 2 Kings xvii. 31. These latter cases are specially instructive, because Adrammelech and Anammelech were also worshipped by the sacrifice of children.

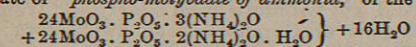
thus distributed over an area measuring about 450 miles from east to west, and about 800 from north to south, and include—(1) the Moluccas proper or Ternate group, of which Jilolo is the largest and Ternate the capital; (2) the Batchian, Obi, and Sula groups; (3) the Ambon or Amboyna group, of which Ceram (Serang) and Buru are the largest; (4) the Banda Islands (the spice or nutmeg islands *par excellence*), of which Lantaoir or Great Banda is the largest, and Neira politically the most important; (5) the south-eastern islands, comprising Tenimber or Timor-Laut, Larat, &c.; (6) the Kei Islands and the Aru Islands, of which the former are sometimes attached to the south-eastern group; and (7) the south-western islands or the Babber, Sermatta, Letti, Wetter, Roma, and Damme groups. At the close of the 16th century this part of the archipelago was divided among four rulers settled at Ternate, Tidore, Jilolo, and Batchian. The northern portion belongs to the Dutch residentship of Ternate, the southern portion to that of Amboyna.

The name Moluccas seems to be probably derived from the Arabic for "king." Argensola (1609) uses the forms *islas Malucas, Maluco*, and *el Maluco*; Coronel (1623), *islas del Moluco*; and Camoens, *Maluco*.

Compare the articles on INDIAN ARCHIPELAGO, ARU ISLANDS, JILOLO, TERNATE, &c., and J. J. de Hollander, *Handleiding bij de Beoefening der Land- en Volkenkunde van Ned. Oost. Indië*, Breda, 1877 and 1882.

MOLYBDENUM, one of the rarer metallic elements (symbol for atomic weight, Mo=96; H=1), occurs in nature chiefly in the two forms of Yellow Lead Ore (PbOMoO₃) and Molybdenite (MoS₂). The latter mineral is very similar in appearance and in mechanical properties to graphite or black lead, and, in fact, was long confounded with it chemically, until Scheele in 1778 and 1779 proved their difference by showing that only the mineral now called molybdenite yields a white earth on oxidation. The metallic radical of the earth, after its discovery by Hjelm, was called molybdenum, from μόλυβδος, lead.

By heating molybdenite in a combustion tube in a current of air, we obtain the trioxide MoO₃ (molybdic acid) as a white crystalline sublimate. This substance, when heated to redness in close vessels, fuses without much volatilization into a yellow liquid, which, on cooling, freezes into a crystalline radiated mass of 4.39 specific gravity. It dissolves in 500 parts of cold, and in 960 of hot water. It dissolves readily in aqueous ammonia or alkalies, forming *molybdates*. Like silica, it combines with bases in a great variety of proportions. Of these many salts, an ammonia salt of the composition 3(NH₄)₂O.7MoO₃+4H₂O (known in laboratory parlance simply as molybdate of ammonia) is the most important, affording, as it does, the most delicate, characteristic, and widely applicable precipitant for ortho-phosphoric acid. To detect phosphoric acid in any substance soluble in water or nitric acid, add first to a solution of molybdate of ammonia an excess of nitric acid, and then (not too much) of the nitric solution of the phosphate, and keep the mixture at 40° C.; the whole of the phosphoric acid gradually separates out in the shape of a canary-yellow crystalline precipitate of "phospho-molybdate of ammonia," of the composition



(according to Gibbs), which is insoluble in the reagent, even in the presence of dilute nitric acid, but soluble in excess of phosphoric acid. By treatment of this complex ammonia salt with aqua regia we can eliminate its acid 24MoO₃.P₂O₅.3H₂O as a substance soluble in water and crystallizing from this solution with 59 molecules of water.

This phospho-molybdic acid plays a great part in chemical toxicology, being a generically characteristic precipitant for all (organic) alkaloids, which combine with it, pretty much as ammonia does, into precipitates insoluble in dilute mineral acids. A solution of the acid sufficient for this purpose may be obtained by saturating carbonate of soda solution with molybdic acid, adding phosphate of soda, one part for every five of MoO₃, evaporating to dryness, fusing, dissolving in water, filtering, and adding nitric acid until the liquid becomes yellow.

Metallic molybdenum is obtained by reduction of the trioxide in hydrogen gas at very high temperatures. It is thus obtained in small crystalline granules which are infusible even in the oxyhydrogen flame. An alloy of the metal with four or five per cent.

of carbon (formerly accepted as molybdenum) fuses in the oxyhydrogen flame into a silver-white metal, of 8.6 specific gravity, which is harder than topaz (Debray).

Analysis.—Molybdenum in all its forms is readily converted into molybdic acid by oxidizing agents, such as nitric acid; or in non-volatile forms into alkaline molybdate by fusion with carbonate of alkali and nitre. Alkaline molybdate is soluble in water; the solution, on a gradual addition of hydrochloric acid, gives first a white precipitate, which then dissolves in the excess of acid. When a piece of zinc is added to such a solution, the latter, through gradual reduction of its MoO₃ to lower oxides, assumes first a blue, then a green, and lastly a deep blackish-brown colour. Molybdic acid colours the blowpipe flame yellowish green. It dissolves in fused borax, forming a head which in the oxidizing flame becomes yellow in the heat, but almost colourless on cooling; the reducing flame colours it dark brown, and may cause the separation of brown flakes of MoO₂. Compare CHEMISTRY, vol. v. pp. 541, 542.

MOMBASA, or less correctly MOMBAS, the *Mwita* of the Sawahili, a town on the east coast of Africa, in 4° 4' S. lat., with the best harbour on all the Zanzibar mainland. The coralline island of which it occupies the eastern portion is 3 miles long by 2½ broad, and lies in the middle of a double inlet of the sea stretching northward into Port Tudor (so called after the English officer who surveyed it) and westward into Port Reitz (after the English resident who died while exploring the Pangani river in 1823). Except at the western end, the coast of the island consists of cliffs from 40 to 60 feet high. In the vicinity of the town palms, mangoes, guavas, baobabs, and cinnamon-trees flourish abundantly, and farther to the west are stretches of virgin forest, the haunt of monkeys, wild hogs, and hyænas. The citadel, originally constructed by Xeixas and Cabrera in 1635, still remains in good condition, "a picturesque yellow pile with long buttressed curtains," but has preserved little of its Portuguese architecture. Of the twenty Portuguese churches which Mombasa once contained, only two or three can be identified. A few of the houses are built of stone, but most of them are mere thatched huts. The population in 1844 was, according to Dr Krapf, from 8000 to 10,000, mostly Wasawahili, but with a considerable number of Arabs and some thirty or forty Banyans. In 1857 Burton estimated the inhabitants at 8000 to 9000, and in 1883 they numbered about 20,000. The Arabs, the Wamwita, and the Wakilindini (the two divisions of the Wasawahili residents, of which the former is the original stock) have each their own chief. In 1875-76 the Church Missionary Society, which made Mombasa one of its stations in 1844, established a settlement for liberated slaves at Freretown (Kisauni) on the mainland, opposite Mombasa. By 1881 it consisted of about 450 persons, of whom about one-fourth were children attending school. The pupils are taught to read both English and Sawahili (*Ch. Miss. Intelligencer*, 1875-76 and 1881). A branch station at Rabbaï numbers 600 inhabitants.

Mombasa takes its name from Mombasa in Oman. It is mentioned by Ibn Batuta in 1331 as a large place, and at the time of Vasco da Gama's visit it was the residence of Calicut Banyans and Christians of St Thomas, and the seat of considerable commerce. The "king" of the city, however, tried to entrap Da Gama, and with this began a series of troubles which give full force to the native name *Mwita* (war). The principal incidents are the capture and burning of the place by Almeida (1505), Nuno da Cunha (1529), and Duarte de Menezes (1537)—this last as a revenge for its submission to the sultan of Constantinople—the building of the Portuguese fort (1594), the revolt of Yusuf ibn Ahmed (1631), the erection of the Portuguese citadel (1635), the five years' siege by the imam of Oman (1660-65), and the final expulsion of the Portuguese (1698). In 1823 the Mazara family, who had ruled in Mombasa from the early part of the 18th century, placed the city under British protection; but Britain soon withdrew, and left the place to be bombarded and captured by Sayyid Said of Zanzibar, who was obliged to make repeated attacks between 1829 and 1833, and only got possession in 1834 by treachery. A revolt against Zanzibar in 1875 was put down by British assistance.

See Capt. W. F. W. Owen, *Narrative*, &c. (1833); Capt. Thomas Boteler, *Narrative*, &c. (1833); Guillaïn, *Voyage*, (Paris, 1856); Krapf, *Travels*, (1860); Burton, *Zanzibar*, (1872).