

### 3. REEF ISLANDS OF AITUTAKI

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This chapter describes the main physiographic features and the vegetation patterns of the smaller islands of Aitutaki (Plates 19 and 34). Of the sixteen islands, fifteen were mapped by compass traverse and pacing and maps based on these surveys are presented here. All are detrital reef islands (motus) with the exception of one volcanic island, Moturakau; the other volcanic island, Rapota, could not be mapped using the traverse method because of its rugged shoreline topography. In addition to the islands, this account also includes the Ootu peninsula which joins the main island of Aitutaki at its northern end but which in many respects closely resembles the motus. For interpretations of the data presented here, reference should be made to Chapters 2 and 5. The very dissimilar reef islands of Rarotonga have been described elsewhere (Stoddart, 1972).

#### Ootu (Plates 3-5 and 13)

The Ootu peninsula, entirely composed of carbonate sediments, extends for 3.25 km along the eastern reefs from its junction with the main volcanic island. Its mean width is about 400 m, with a minimum of 250 m; at its widest, near the junction with the main island, it reaches 750 m in width. If separate, it would have been the largest of the Aitutaki motus; Tekopua, the largest, is 2.25 km long. The seaward beach crest rises 2-3 m above high water, and the surface slopes gently to the lagoon; there are no dunes except at the southern point. According to Hochstein (1967), seismic refraction measurements show the reef sediments under Ootu to be 13-20 m thick.

Because of its connection with the main island the peninsula has undergone considerable alteration by man. Two intersecting runways, respectively 1800 and 1500 m long, were constructed during World War II and are still in use. Their construction entailed levelling of the land and clearing of the vegetation adjacent to them. The only woodland remaining is along the lagoon shore and south of the main runway, where there is a less disturbed area approximately 600 m long and 450 m wide. Elsewhere the vegetation is periodically cleared and is restricted to low shrubs, herbs and grasses.

The main vegetation seaward of the main runway is Scaevola scrub 1-1.5 m tall, with similar shrubs and occasionally trees (3-5 m tall) of Tournefortia. The most frequent tree is Pandanus, 3-5 m tall, with Morinda citrifolia, and shrubby trees



of Guettarda speciosa and Hibiscus tiliaceus, all cut back from time to time. Much of the ground surface is bare sand with Cassytha filiformis, large erect Portulaca, Heliotropium anomalum, Euphorbia hirta, and several grasses and sedges (Dactyloctenium aegyptium, Cenchrus echinatus, Cynodon dactylon, Fimbristylis cymosa, Cyperus javanicus). The seaward beach is mainly coarse sand with patches of gravel; the outpost vegetation comprises Ipomoea pes-caprae and Triumfetta procumbens. In places near the airstrip there are extensive patches, now relict, of introduced decorative plants such as Gaillardia.

South of the airstrip there is a denser scrub, with Euphorbia chamissonis and Corchorus torresianus up to 1 m tall and occasional small trees of Tournefortia, Guettarda, Morinda, Hibiscus, Leucaena insularum, and, rarely, Pisonia. Capparis is found occasionally; this species is not common at Aitutaki.

Between the scrub and the lagoon shore is a taller woodland dominated by trees 12-15 m tall of Pisonia grandis, with Hibiscus tiliaceus, Morinda citrifolia, Guettarda speciosa, and coconuts. The ground cover is very sparse, and much of the surface is covered with leaves and coconuts. Groves of Pandanus tectorius occur in the woodland, with trunks up to 3 m tall before branching. Coconut woodland extends along the lagoon side of the Pisonia-Hibiscus woodland. The trees are 15 m tall and there is little undergrowth. There are some massive trees 10 m tall of Guettarda speciosa, and occasional Casuarina. Further north, on the lagoon side of the airstrip, there is a scrub woodland of Hibiscus, Guettarda and Scaevola, with Triumfetta and Vigna, and along the shore itself, extending to the waterline, a belt of Pemphis acidula with Sophora and Suriana. Some swampy depressions near the lagoon shore are unvegetated.

The southern shore of the peninsula has low dunes with Pemphis, Tournefortia and Scaevola, and a ground cover of Fimbristylis and Cyperus. Colubrina asiatica is common in the nearshore scrub.

The vegetation of Ootu is characteristic of the motus in the presence of such species as Scaevola and Tournefortia and of trees such as Guettarda and especially Pisonia. Several species are common on the peninsula, however, but are not found on the motus. These are mostly grasses (Dactyloctenium aegyptium, Cynodon dactylon, Cenchrus echinatus), sedges (Cyperus javanicus), and herbs, often cultivated and weedy species (Spermacoce suffrutescens, Euphorbia hirta, Mimosa pudica, Solanum nigrum, Datura metel, Momordica, Gaillardia).

#### Akitua (Figure 17)

Akitua is the northernmost of the motus, separated from the southern end of the Ootu peninsula by a channel less than 2 m deep. The island is triangular, 750 m long and up to 310 m wide.



The seaward coast is lined by a discontinuous and irregular conglomerate platform with a maximum exposed width of 50 m; the platform is generally mantled by a recent rubble spread of about the same width. Beaches on the north and south sides are narrow, with overhanging vegetation in places and some cliffing. The only extensive area of unvegetated sand is a lagoonward sand spit 200 m long.

Pemphis scrub forms a zone 50 m on the seaward side of the island, and a narrow fringe along the north and south shores. This is replaced by Suriana scrub on the northeast shore inland of the conglomerate platform. A mixed scrub, dominated by Scaevola but with Tournefortia, Sophora, Suriana, Pemphis, and low trees of Guettarda, is extensive at the west end and in the north.

The centre of the island is covered with Cocos-Guettarda woodland with Morinda, Leucaena and Pandanus. The woodland is open and there is a well-developed shrub layer beneath. This includes Timonius polygama, Corchorus torresianus, Sida rhombifolia and Euphorbia chamissonis. Ground cover is also luxuriant, comprising grasses and sedges (Cenchrus echinatus, Fimbristylis cymosa), fern (Polypodium), and herbs and vines (Ipomoea pes-caprae, I. macrantha, Cassytha filiformis, Triumfetta procumbens, Emilia sonchifolia, Boerhavia repens, Bidens pilosa). Several of these species (e.g. Cenchrus) are uncommon or absent on other motus and are present on Akitua because of its proximity to Ootu: some are only found at the point where the path from Ootu reaches the beach crest.

The only other woodland consists of clumps of Casuarina at the west end and along the south shore. Both Hibiscus and Hernandia are absent. One vegetation type is represented only on Akitua of the Aitutaki motus: a sedge marsh occupying a depression with standing water, and dominated by Cladium jamaicense 2-2.5 m tall.

#### Angarei (Figure 18, Plates 8 and 21)

Angarei, Ee and Mangere form a group of very similar islands separated by narrow channels and which probably originally formed a single entity. Ee is the largest, and the two islands to north and south closely resemble each other. Angarei has maximum dimensions of 480 and 400 m. It consists of rubble, cobbles and gravel, with unusually narrow lagoon beaches overhung with vegetation. There is a conglomerate platform up to 40 m wide along the seaward coast.

The vegetation is clearly zoned. Pemphis scrub forms a zone up to 50 m wide along the seaward side, and also extends as a narrow fringe around the leeward shores. Few other plants, apart from outpost Triumfetta and Vigna, are found in this zone. Inland of the Pemphis is a zone of Suriana scrub up to 125 m



wide with occasional Tournefortia shrubs. The Suriana is less dense than the Pemphis; the sand beneath is bare, except for trailing Cassytha and occasional Heliotropium. Much of the centre of the island is occupied by a scrub 1-1.5 m tall of Scaevola, with Euphorbia chamissonis and occasional trees of Morinda, Guettarda and Pandanus 2-3 m tall.

Woodland is confined to an area of coconuts and a grove of Casuarina on the northwest side of the island. The coconuts occur with Morinda, Guettarda, and the shrubs Colubrina asiatica and Corchorus torresianus; a single Hernandia seedling was seen. The Casuarina grove is also open and mixed with Guettarda and shrubby Scaevola and Euphorbia chamissonis, with Fimbristylis on bare sand.

Ee (Figure 19, Plates 9 and 28)

The third largest of the Aitutaki motus, and probably formerly connected with Angarei and Mangere to north and south, Ee is 975 m long, parallel to the reef edge, and up to 410 m wide. A conglomerate platform lines the whole of the seaward coast of this rectangular island; it varies in width from 10 to 50 m. The inner parts of the platform are mantled with rubble and boulders: much rubble extends back into the Pemphis zone, and there are boulders 1-1.5 m in diameter even in the woodland. Beaches are very narrow all round the island, and vegetation reaches the sea along most of the lagoon coast.

Pemphis extends almost continuously around the island's shores, as a narrow strip on the lagoon shore and as a zone up to 30 m wide on the seaward side; it is also present along the north and south shores. The most extensive vegetation type is, however, Suriana scrub, extending across the greater part of the island towards its northern and southern ends, and elsewhere forming a zone 50-60 m wide. The scrub is generally 2-3 m tall, and reaches a maximum of 4 m. Other species present include Euphorbia chamissonis and Cassytha filiformis. Further inland other shrubs become more common, including Sophora, Scaevola, and Colubrina, the latter 3-4 m tall. Under this taller scrub is a sparse ground cover of Euphorbia, Fimbristylis and Cassytha.

There are three main types of woodland on the island. Cocos-Guettarda woodland occupies a compact area about 250 m in diameter, with several smaller groves. The trees of Guettarda reach 10 m in height, Pandanus 7 m, and tall shrubs of Colubrina 5 m. Other shrubs in the more open woodland include Scaevola, Suriana and Euphorbia, with Fimbristylis on otherwise bare ground. In the more dense and deeply-shaded woodland, Scaevola is absent and is replaced by Timonius polygama; there are many young coconuts as well as Guettarda and Pandanus. Juvenile Hibiscus is present, and, rarely, individual trees of Pisonia. This woodland is margined by a zone of Pandanus and Guettarda.



No other plants grow in this zone, and the ground is deeply covered with trash of Pandanus leaves. The third woodland type comprises Casuarina groves on the lagoon shore. Low Scaevola, Suriana and Euphorbia are found in these open groves, with Heliotropium, grasses, Triumfetta and Vigna. One Leucaena tree was seen.

#### Mangere (Figure 20, Plate 10)

A small island south of Ee, with maximum length and breadth of about 350 m, Mangere comprises a seaward continuous conglomerate platform 35-55 m wide, a rubble spread, and a leeward sandy area. Beaches are almost non-existent on the lee side, where vegetation reaches the sea.

The vegetation consists mainly of low scrub with a leeward area of coconut woodland. Pemphis forms a zone up to 30 m wide on the seaward side of the island, and a narrow fringe on the lagoon shores. The most extensive scrub is dominated by Suriana maritima, in a zone up to 130 m wide, replaced inland by a more mixed scrub, dominated by Scaevola, with Tournefortia and some Pemphis, Guettarda and Pandanus. Most of the scrub is 2-3 m tall; some of the seaward Pemphis reaches 4 m. The coconut woodland is distinctly taller, with much Guettarda up to 8 m. Other trees include Pandanus and Leucaena. In more open areas there is extensive scrub beneath the trees, mainly Scaevola about 1 m tall but in places reaching 2 m, and Timonius polygama reaching 2.5 m. Euphorbia chamissonis forms a lower dwarf scrub, and other plants beneath the woodland include Fimbristylis, Triumfetta and Tacca. Polypodium is common in more deeply shaded places. The narrow leeward beaches have an outpost vegetation of Ipomoea and Vigna with Heliotropium and occasional Tournefortia.

#### Papau (Figure 21, Plates 18 and 22)

Papau is a small isolated island, rather irregularly shaped, 400 m long and 200 m wide, with a discontinuous dissected conglomerate platforms 35-75 m wide on its seaward side. Coral rubble and boulders are scattered along the seaward shore, but sand and gravel beaches are better developed here than on the islands to the north. The rubble includes large boulders of Porites 1.5 m in diameter. Large blocks, many of them more than 1 m in diameter, are found well inland as well as on the shore. The island reaches a height of 2-2.5 m above sea-level. On the north coast the shore is being eroded, revealing a sequence of soil horizons covered by storm sands and gravels. The sequence is:



## Surface

Humic pebbly sand with roots	13 cm
White fine sand	15 cm
Dark humic sand with roots	5 cm
White fine sand	10 cm
Black humic sand with roots	13 cm
Coarse gravel	18 cm
Fine white sand to beach	100 cm +

For so small an island the vegetation is of some interest. The usual zone of Pemphis is here narrow and discontinuous on the seaward side, with an average width of only 10 m. There is some indication that its width has been reduced by shore retreat. The Suriana zone, with some Sophora, has a more normal width of up to 130 m. On the leeward side there is an area of coconut-Guettarda woodland 8-15 m tall. Other trees include Pandanus, low Morinda, and Leucaena. Shrubs beneath the woodland are Timonius polygama, Scaevola (to 1.5 m), Sophora, and Euphorbia chamissonis, with on the surface Stenotaphrum, Fimbristylis, Portulaca, Cassytha and Lepidium bidentatum. Within the coconut woodland is an area of tall, closed-canopy broadleaf woodland, consisting mainly of Pisonia grandis, Hernandia and Guettarda. The ground surface in this woodland is mainly covered with trash, with Triumfetta and Polypodium, and occasional Tacca and sedges. There is some leeward beach scrub of Scaevola and Tournefortia, with Heliotropium and Ipomoea.

Tavaerua Iti (Figure 22)

A small island immediately north of Tavaerua, Tavaerua Iti is rather regularly shaped, 250 m in maximum length (transverse to the reef) and 210 m wide. The reef edge lies 120 m to seaward. The outer 60 m of the reef platform comprises a boulder zone, the inner 60 m a moat 0.5-1 m deep. The outer 45 m of the moat is sand-flored, but the inner part is bare rock, with outliers of the conglomerate platform near shore. Small patches of the conglomerate platform extend between the two islands, and it is possible that they were formerly connected. On the seaward side of the island the conglomerate platform is low and dissected, with an irregular outline; it is unusually narrow (a few metres wide), except where it extends lagoonward along the north and south shores. Assuming its continuity beneath the seaward rubble spread with Pemphis, its maximum width is about 55 m. The island is mainly formed of coral rubble, with narrow leeward beaches, and a lobe of coarse sand on the northern side.



About one-third of the island is wooded, and the rest is covered with scrub. Pemphis forms a continuous zone on the seaward side, up to 25 m wide and 2 m tall. Inside this there is a zone of Suriana, also 2 m tall but with a maximum width of about 60 m. Towards the sea this is fairly pure, but inland it becomes more open, with Euphorbia chamissonis, Triumfetta procumbens, Vigna marina and Ipomoea macrantha. The transition between the scrub and the woodland is formed by a dense thicket of Pandanus fringing the taller coconut woodland on its seaward side. The latter includes tall Guettarda and Pandanus, juvenile Hibiscus, Timonius polygama up to 5 m tall, Euphorbia chamissonis, Tacca, and, on the ground, Boerhavia, Fimbristylis, grasses and Poly-podium. The leeward beaches are fringed by mixed woodland of Pandanus and Guettarda, a grove of Casuarina 6 m tall, Scaevola and Euphorbia chamissonis, and outpost Heliotropium. There is evidence of burning of the vegetation, especially of Pandanus thickets.

#### Tavaerua (Figure 23, Plate 11)

Tavaerua closely resembles Taverua Iti, but is larger: the island is 290 m wide and 500 m long. The conglomerate platform on the seaward side is intricately dissected, with promontories and deep inlets and many separate outliers. It reaches 30 m in width but much of it is only a few metres wide. It does not extend far lagoonward on the north and south coasts. The leeward beaches are sandy, and in the south over 10 m wide; on the lagoon shore there is some erosion and cliffing, and patches of gravel and rubble.

The seaward Pemphis zone, 50 m wide, has shrubs up to 5 m tall. The Suriana zone within, 80 m wide, is rather lower. About half of the island is occupied by coconut-Guettarda woodland, with Pandanus. In spite of the size of the woodland there are no other big trees. Pandanus forms an exclusive thicket round the seaward side of the woodland, at the junction with the Suriana scrub. In the woodland there are seedlings of Morinda, young Guettarda 2-5 m tall, dense Scaevola scrub up to 1.5 m tall, Timonius polygama commonly reaching 1-2 m, and Euphorbia chamissonis. Cassytha is present but is not common. On the lagoon coast there is a tall scrub of Suriana (up to 3 m tall), Tournefortia (to 2 m) and Timonius, with Euphorbia chamissonis, Triumfetta, Heliotropium and Fimbristylis. The ground surface is higher along the lagoon side, and falls towards the seaward margin of the woodland to the rubble and gravel spreads under the seaward scrub.

#### Akaiami (Figure 24, Plates 20 and 27)

The second largest of the motus, Akaiami was formerly used as a base for the Solent flying-boat service, and resthouses, refuelling depot and customs building were erected there (Wood and Hay, 1970, p. 37). Little trace now remains of these,



though there are remnants of old jetties on the lagoon shore. The island is 1120 m long and up to 410 m wide. Unlike most of the other motus it has a prominent seaward beach ridge of gravel and cobbles, and for much of the seaward shore this overlies and obscures the conglomerate platform. Where exposed this is 30-65 m wide, and dissected by inlets. There is an extensive separate remnant of the platform south of the island. Wide sand beaches extend round the leeward side of the island; the lagoon beach ridge is 0.6 m high and 50 m wide, and the interior of the island is somewhat lower. There is a small exposure of near-shore beach rock on the south coast.

Unusually, Pemphis scrub is not well developed on the seaward side of the island: it forms a narrow fringe in the north of the island, and a zone 10 m wide in the south, where the conglomerate platform is widest; it is absent along much of the seaward beach ridge, and is most extensive at the southwest point. Suriana scrub too is weakly developed: it forms a narrow zone on the seaward beach ridge, with outpost Heliotropium, Euphorbia chamissonis, Triumfetta and grasses. The place of Pemphis and Suriana is taken by Scaevola scrub, forming a zone up to 30 m wide and 1 m tall, with occasional Tournefortia to 2 m, along the seaward side. Euphorbia chamissonis and Capparis cordifolia are also present. This scrub terminates landward in a zone of tall massed Pandanus at the fringe of the coconut woodland.

In more open parts of the woodland there are trees of Morinda up to 6 m tall and of Guettarda up to 8 m. Timonius and Euphorbia chamissonis are common low shrubs, with Tacca, Vigna, Fimbristylis and grasses on the ground. Thomson (1968) has described fertiliser experiments on coconuts in the southern part of the island. He found that of 247 palms aged 2-75 years only 67 were bearing nuts, 27 were beyond bearing age, and the rest were unproductive and too crowded. Yield was only 10.7 nuts per bearing palm. With different fertilisers on 0.75 acre experimental plots he obtained yields of 23.9-47.8 nuts per tree. Elsewhere the woodland is more dense and the ground more shaded. Morinda and Guettarda are both much lower, and Polypodium replaces the sedges and grasses on the ground. Near the seaward margin of the woodland Guettarda increases in density until it forms a zone 3-5 m wide immediately inland of the Pandanus fringe, normally about 10 m wide.

#### Muritapua (Figure 25, Plates 14, 17 and 29)

Muritapua is a small island between Akaiami and Tekopua, 360 m long transverse to the reef edge, and 150 m wide. It has a very irregular seaward conglomerate platform up to 95 m wide, which is scattered with large boulders, mostly of single coral colonies; one of Porites measures 2 x 1.7 x 1.5 m. Most of the surface of the island is formed of gravel and cobbles, with sand beaches on the leeward side, in places formed of mainly Halimeda sand.



The seaward Pemphis zone, up to 50 m wide, is well-developed, with standing in prominent windrows oriented at 280°. Pemphis also occurs intermittently round the lee shores, with Heliotropium and occasional Scaevola. Many of the Pemphis bushes are covered with Cassytha. The most extensive vegetation type is Suriana scrub, surrounding the small central area of woodland on all sides except the north where it is replaced by Scaevola. The scrub contains low Scaevola, some Pemphis, Euphorbia chamissonis and juvenile Pandanus, with Ipomoea macrantha, Triumfetta and grasses on the largely bare ground surface. Cassytha is common, especially on Scaevola. The main area of coconut woodland is only 100 m in diameter, with trees 8-12 m tall. There are patches of Euphorbia and Scaevola beneath the trees, with a sparse ground cover of Triumfetta, Tacca, Fimbristylis, grasses and Polypodium. The surface under the woodland is irregular, with old beach ridges and coral blocks up to 0.6 m long scattered over the gravel and cobbles. Seaward of the coconut woodland is a fringe of Guettarda, 6-7 m tall, with some Pandanus.

#### Tekopua (Figure 26, Plates 12, 15 and 30)

Tekopua is the largest of the motus, 2250 m long parallel to the reef edge, with an average width of 300 m and a maximum width of 480 m. The seaward reef flat is 150-200 m wide, and consists mostly of a rock-floored moat up to 1 m deep with a higher algal rim. The seaward coast of the island is lined by a continuous conglomerate platform, undissected in the north but crenulate and irregular in the south, with a maximum width of 65 m. In places the conglomerate platform comprises parallel ridges with pronounced seaward dip and landward-facing scarps; some of these are composed of sand rather than gravel and are probably beach rocks. The inlets in the conglomerate platform contain high densities of Holothuria atra, with up to 20 per sq m.

As at Akaiami the conglomerate platform is overlain by a pronounced seaward beach ridge rather than by a flat rubble spread, and the usual Pemphis scrub zone is absent. Pemphis is present only as tall spreading open-branched shrubs on the south coast. Suriana forms a continuous zone along the seaward side, up to 65 m wide, with few other species represented apart from occasional Tournefortia and Pemphis. Low Suriana, with Scaevola, Tournefortia, and in the south Sophora, also forms a narrow fringe on the lagoon shore. Most of the island is covered with a dense coconut woodland. Other trees present include very common Guettarda; tall Hernandia, especially towards the south; Leucaena; Morinda; and trees of Tournefortia 12-14 m tall. These latter are now overtopped by coconuts and Hernandia and are not reproducing. They are more common on the seaward side of the woodland, and may indicate a recent extension of the coconuts. Juvenile trees and low shrubs beneath the woodland include Pipturus argenteus, Timonius polygama, Colubrina asiatica, Hernandia, Sophora, Scaevola, and Euphorbia chamissonis.



Tacca is common, and Capparis is present. The coconuts are more actively managed in the north of the island, where the undergrowth is burned and the ground is largely bare apart from scattered Vigna, Heliotropium, Tacca, Euphorbia and grasses. Elsewhere the woodland is much more dense, and grades into a mixed coconut-Pandanus-Guettarda thicket. Towards the south there is an area of pure Pisonia woodland measuring 520 x 200 m, with tall trees 3-4 m apart, growing on a rubble surface covered with rotting trunks and other trash. Pisonia trees up to 20 m tall are also found in the adjacent coconut woodland, with Morinda, Guettarda and Pandanus and an undercover of Euphorbia. At the southwest point there is a developing sandspit with a zonation of vegetation types outwards from the coconut woodland of: low Scaevola with Cassytha and Euphorbia; tall Pemphis; low Suriana. Apart from clumps of Fimbristylis and some Cenchrus the ground surface is bare.

Terrestrial invertebrates were collected on Tekopua during the Expedition by Wise (1971, pp. 58-60).

#### Tapuaeta (Figure 27, Plate 33)

Tapuaeta is a small island south of Tekopua, from which it is separated by a deeply scoured channel opening lagoonwards. The island is aligned transverse to the reef-edge, and is 570 m long and up to 210 m wide. It is entirely built of sand, with its surface standing about 1.5 m above sea level. The beaches are sandy, except for cliffed eroded sectors on the north, east and south shores. Beach rock outcrops at several places, with a prominent line 160 m long extending offshore to the southwest.

Coastal scrub comprises mainly Pemphis in the east, with elsewhere Scaevola and Tournefortia with Sophora. These all form a narrow fringe round a mixed woodland dominated by coconuts which covers most of the island. A dense woodland of coconut and Guettarda, floored with coconut trash and Polypodium, becomes more open to the west, where juvenile coconuts 3-4 m tall are scattered through a scrub of Scaevola and Euphorbia with juvenile Pandanus, Guettarda and Morinda, and, on the ground, Tacca, Vigna, Portulaca, sedges and grasses. Towards the east the coconuts are taller and closer, with massive trees of Hernandia sonora and Guettarda. There is an understory of Hernandia seedlings, Hibiscus tiliaceus and Morinda, and a ground layer of Vigna, Cassytha and Euphorbia. Trees of Pisonia grandis are present in this woodland, but they do not form a distinct vegetation type.

The island is uninhabited, but there are wild pigs in the woodland.



### Sand cay south of Tapuaeta (Figure 28)

A small sand cay south of Tapuaeta is 190 m long and up to 70 m wide. It is entirely built of sand. The vegetation is restricted to a low scrub of Suriana maritima, with two low bushes of Tournefortia. There is no conglomerate platform and no beach rock.

### Motukitiu (Figure 29, Plates 26 and 31)

Motukitiu is the southernmost island on the eastern reef. It is 450 m long and 300 m wide, with a narrow seaward conglomerate platform or ledge covered by a wide spread of largely unvegetated fresh gravel and cobbles up to 100 m wide.

There are patches of wind-sheared Pemphis mostly less than 2 m tall, with the largest shrubs reaching 3 m, forming a zone up to 40 m in width, on the northern part of this gravel spread, close to the sea, but the most extensive scrub is formed by Suriana maritima. This forms a zone up to 95 m wide, occupying about one-third the width of the island, with shrubs rising inland to a height of 4 m. The Suriana is mainly a pure stand with scattered Tournefortia. In pioneer situations seaward of the Suriana zone, on the rubble flat, there are low bushes of Suriana and Scaevola 1-2 m apart and numerous seedlings of Heliotropium anomalum. The Suriana zone passes landward through a fringe of Pandanus and Guettarda into coconut woodland. This averages 100 m in width. Guettarda and Pipturus are common under the coconuts, Morinda is rather rare. The ground cover comprises Boerhavia tetrandra, Triumfetta procumbens, Ipomoea macrantha, Vigna marina, grasses and Polypodium. Capparis cordifolia is present but rare. On the lagoon coast there is a wide sand beach, with Scaevola up to 2 m tall, Polypodium, grasses and sedges, and outpost Triumfetta and Heliotropium. Low shrubby trees of Cordia are present on the beach crest in the north.

Wise (1971, pp. 58-60) collected terrestrial invertebrates on Motukitiu in 1969.

### Moturakau (Figure 30, Plate 23)

One of the two small volcanic islets on the southern reef rim, Moturakau is 460 m long in a north-south direction and 120 m wide. The core of the island is a steep ridge of volcanic rocks 160 m long on the east side of the island, extended in an abrasion platform cut in volcanic rocks for 100 m to the south. Wood and Hay (1970, p. 38) describe the volcanic rocks as comprising 9 m of well-bedded agglomerate containing palagonitic ash, angular basalt and coral fragments, mostly dipping 10° toward the west. Carbonate sands extend the island to the west and south of this volcanic core.



The vegetation is very different from that of the other reef islands. On the west side of the ridge, on volcanic soil, is a dense woodland of Calophyllum inophyllum 40-50 m wide, with Guettarda, Morinda, Leucaena and some Hibiscus tiliaceus. Calophyllum is not found on the normal reef islands. The woodland is deeply shaded, and ferns are plentiful on the ground and boles of trees. This woodland is surrounded by a coconut-Hibiscus woodland, especially towards the southern point. Under the trees there is some low Scaevola, together with Vigna marina and grasses. The steep eastern slope of the volcanic ridge is vegetated with tall Fourcraea and some Hibiscus, with Polypodium in crevices, and also tall Pandanus tectorius. There are vines of Abrus precatorius over the bare rock. Beach vegetation on the leeward side is more typically that of the motus, with patches of Sophora and Pemphis, and outpost Ipomoea pes-caprae and Vigna, but no Suriana or Tournefortia.

The island was formerly used as a leper colony but is now uninhabited. Magnetic samples were collected here during the 1969 Expedition by Lumb and Carrington (1971).

#### Rapota (Plates 24 and 25)

The main island consists of a rounded hill of basalt surrounded by large basalt boulders, which form the shorelines. These boulders are set in a calcareous matrix up to about 1.5 m above sea level on the south coast. Marshall (1930, p. 40) recorded nephelinite and basalt from this island. Wood and Hay (1970, p. 38) record 1.8 m of "flow-banded nephelinite ... on a subhorizontal weathered zone in porphyritic limburgite. The weathered zone is 6 to 8 in thick (15-20 cm) and yellowish brown in colour. Also present in agglomerate on Rapota Island are pebbles of trachyte and phonolite, presumably erupted during a late stage in the volcanic history of Aitutaki."

The island is covered with a dense woodland of Calophyllum inophyllum with tall trees of Hernandia, Cocos, Casuarina and Morinda, with Pandanus, Hibiscus and Thespesia. The ground cover consists of Polypodium, Tacca, Vigna marina, Abrus precatorius and grasses. Two small islets offshore also have trees of Calophyllum, Pandanus and Cocos; that to the north also has Guettarda, Thespesia and Scaevola, and that to the east Hibiscus and Pemphis. Otherwise Rapota lacks some of the most common plants of the motus. Mature trees of Erythrina variegata and Mangifera indica suggest that the island was formerly inhabited.

Magnetic samples were collected here during the 1969 Expedition (Lumb and Carrington, 1971), and also terrestrial invertebrates (Wise, 1971, pp. 58-60).

#### Maina (Figure 31, Plate 16)

Maina is a true sand cay located near the southwestern reef



point of Aitutaki. It is a sandy island 710 m long and 310 m in maximum width. There is no counterpart of the conglomerate platforms of the eastern motus, but beach rock is widely if discontinuously exposed along the foot of beaches. These latter are exceptionally wide for Aitutaki, reaching 40 m in the southwest.

Most of the island is covered with a tall open scrub. At the eastern end and along the north shore this comprises Scaevola (1-1.5 m tall) and Tournefortia with Guettarda. The scrub is rather open and the ground surface bare except for Fimbristylis and Cassytha. The western end of the island is occupied by a scrub 1.5-2 m tall of Suriana maritima with occasional Tournefortia reaching 2 m. Other shrubs such as Scaevola and Colubrina are also present, but patchily. The ground surface is again rather bare, with Cassytha, grasses, Portulaca, and some Euphorbia chamissonis. The open coconut woodland near the centre of the island includes Hibiscus and Pandanus; shrubs such as Scaevola and Colubrina; and, on the surface, mainly Triumfetta, Heliotropium and Cassytha, with Tacca, Portulaca, Euphorbia, Polypodium and grasses.

The island is uninhabited, but there is a light tower on the south coast, erected in 1954. Wise (1971, pp. 58-60) collected terrestrial invertebrates here during the 1969 Expedition.

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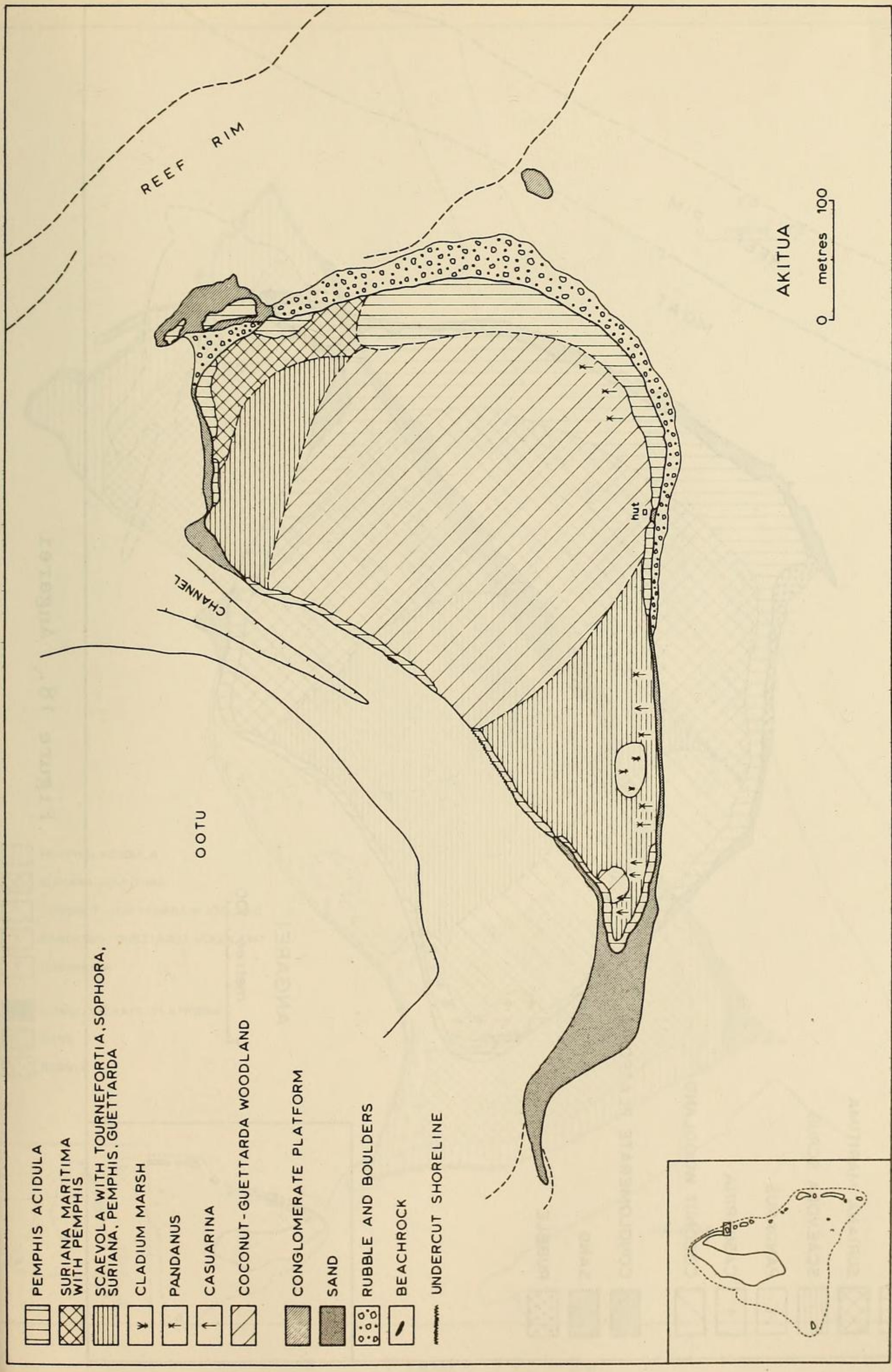


Figure 17. Akitua



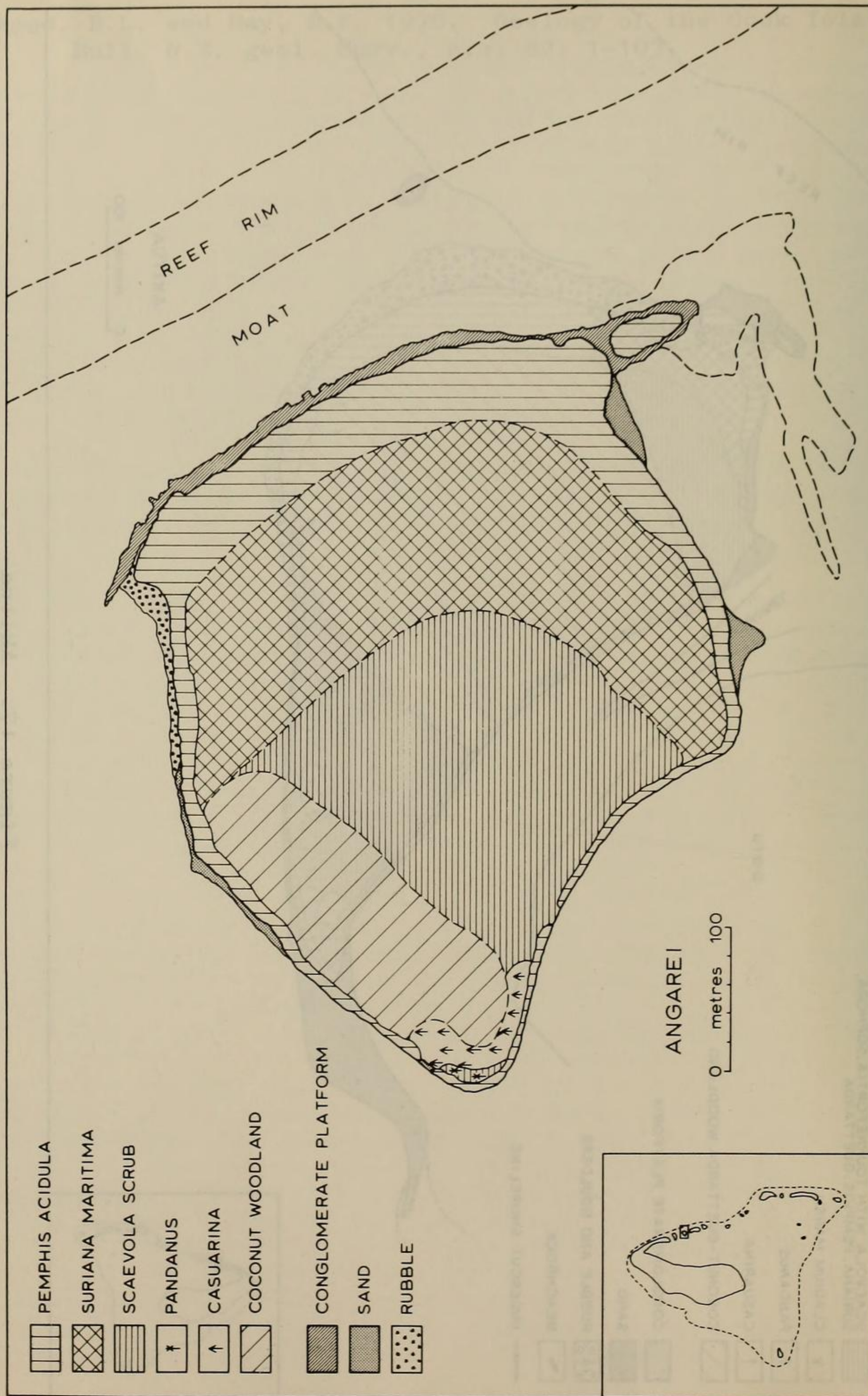


Figure 18. Angarei



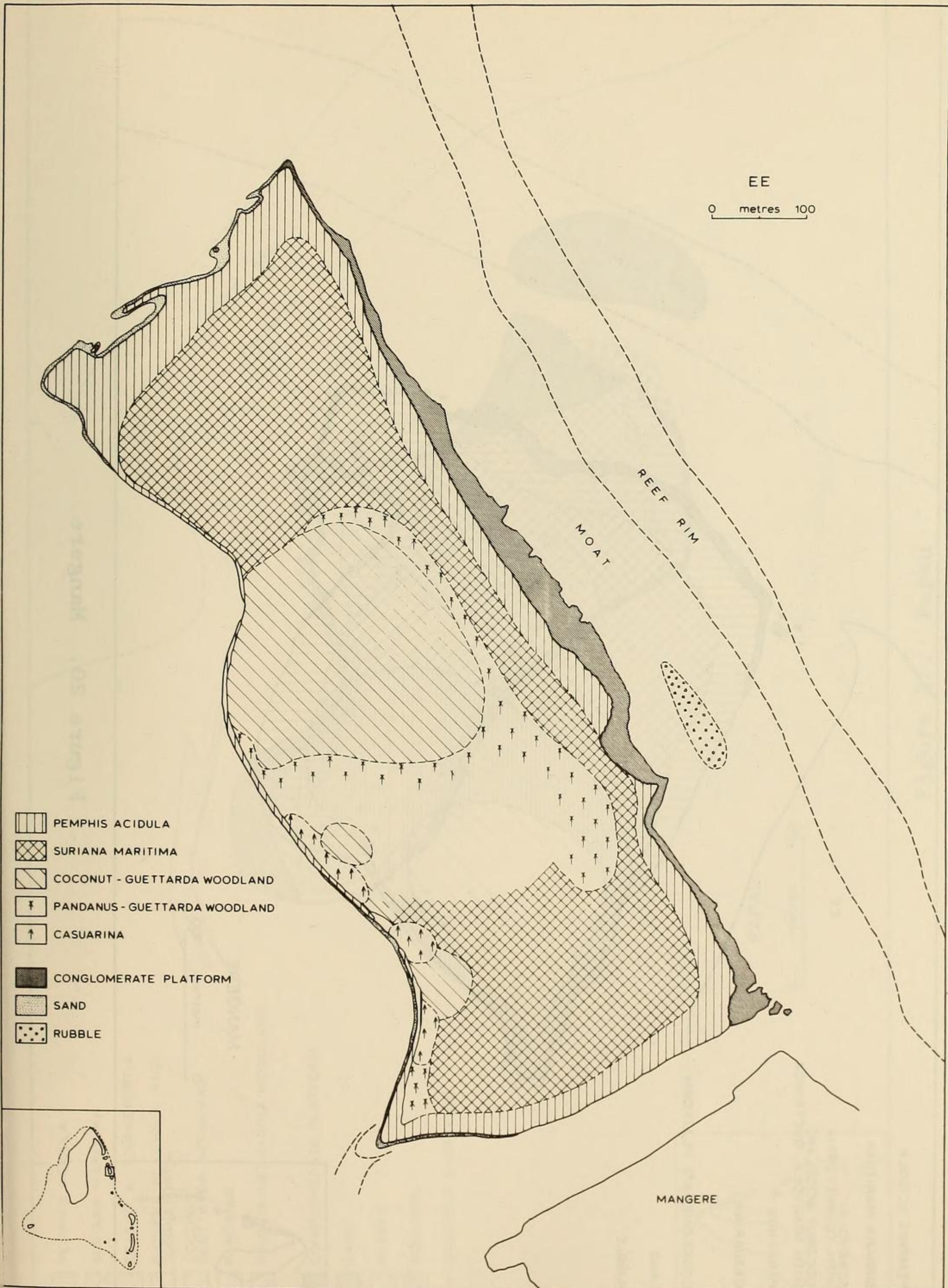


Figure 19. Ee



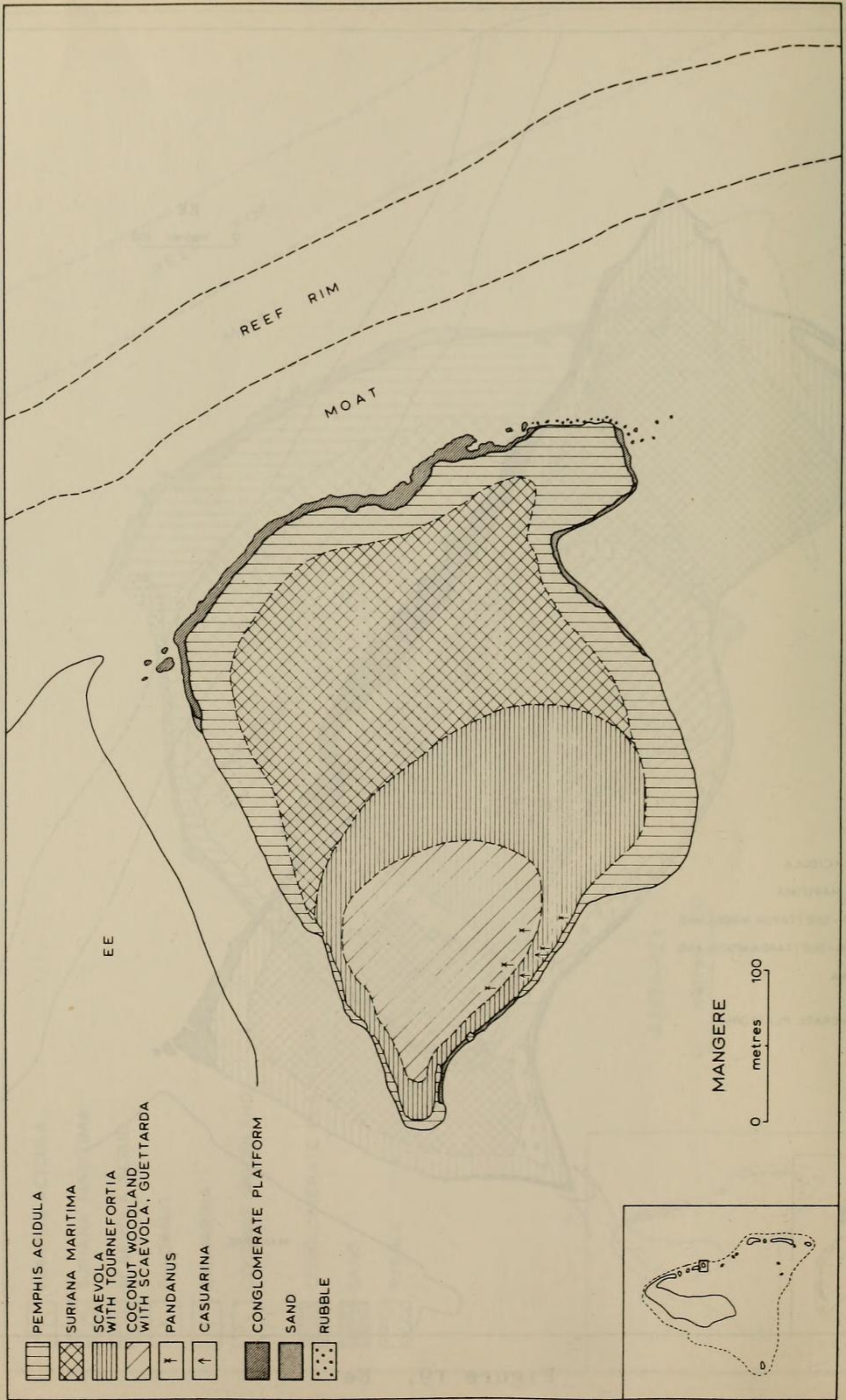


Figure 20. Mangere



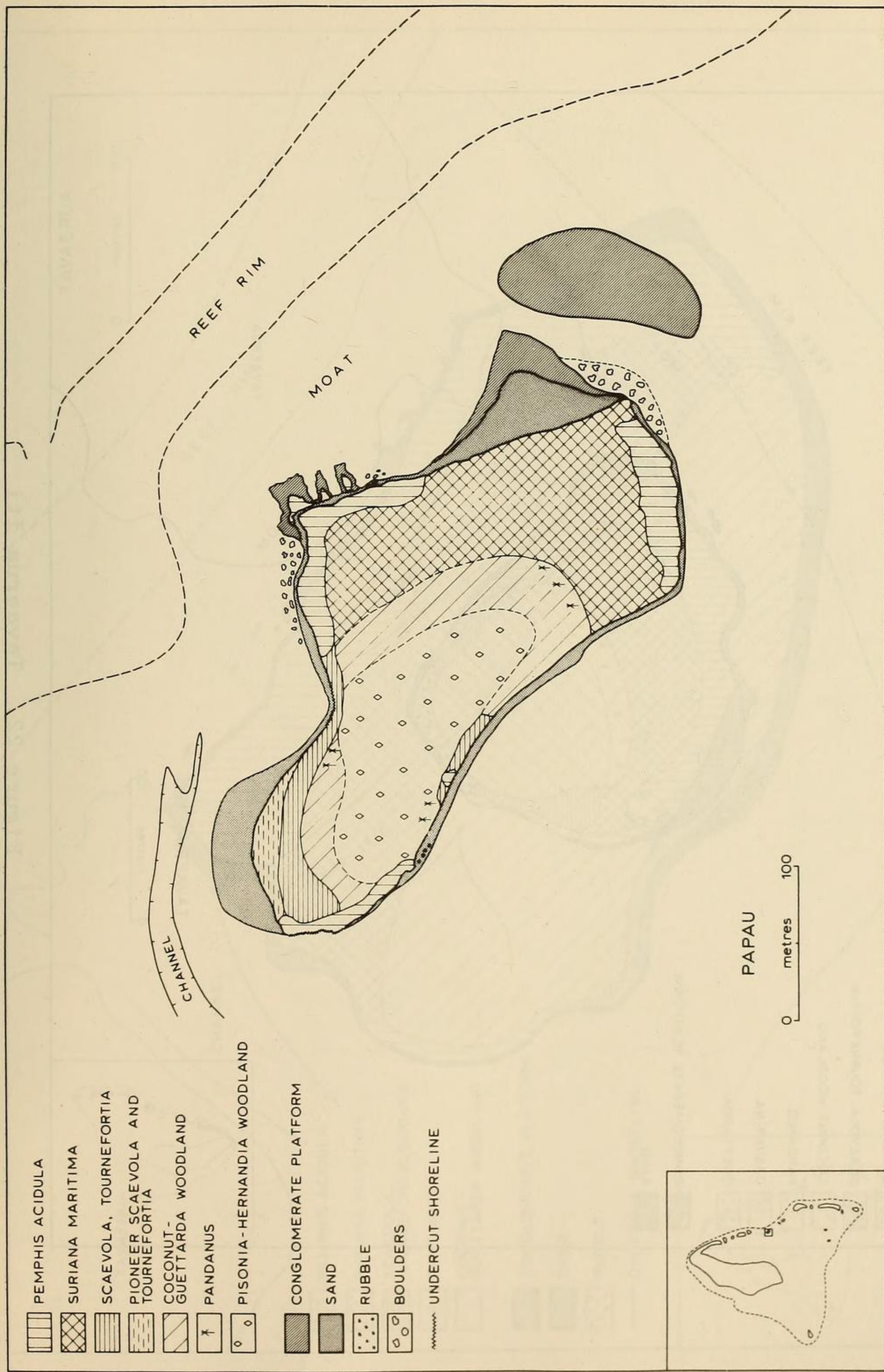


Figure 21. Papua



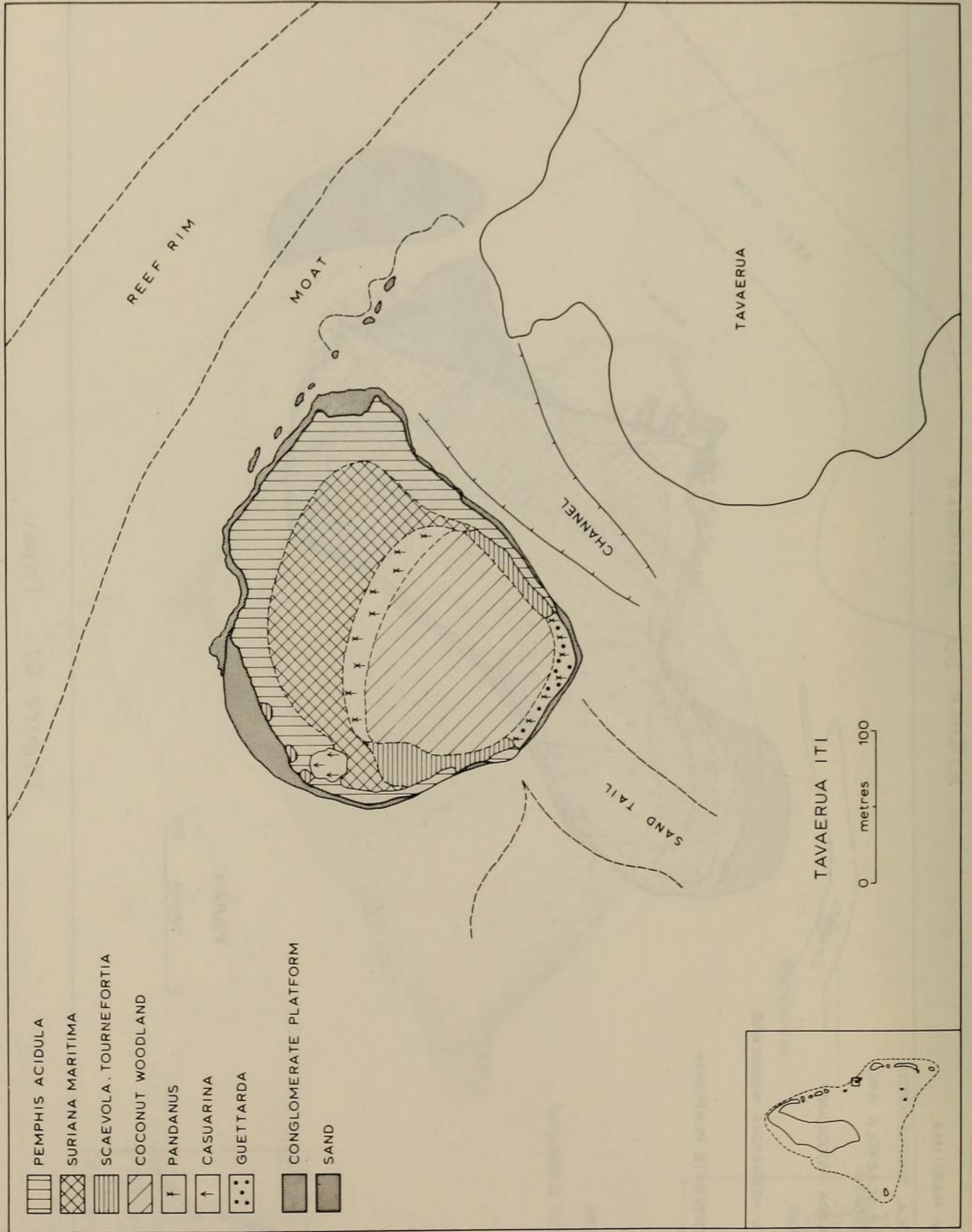


Figure 22. Tavaerua Iti



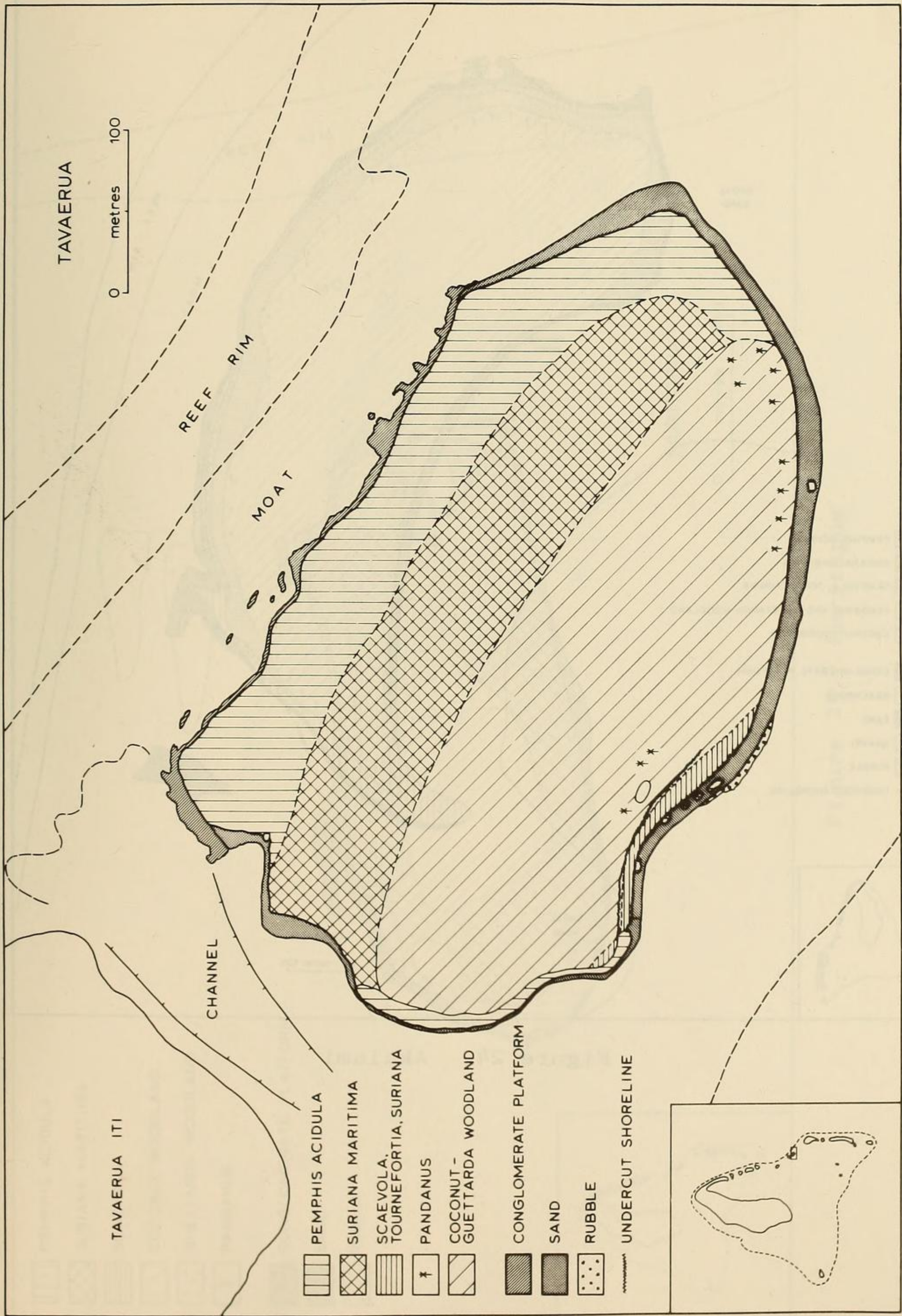


Figure 23. Tavaerua



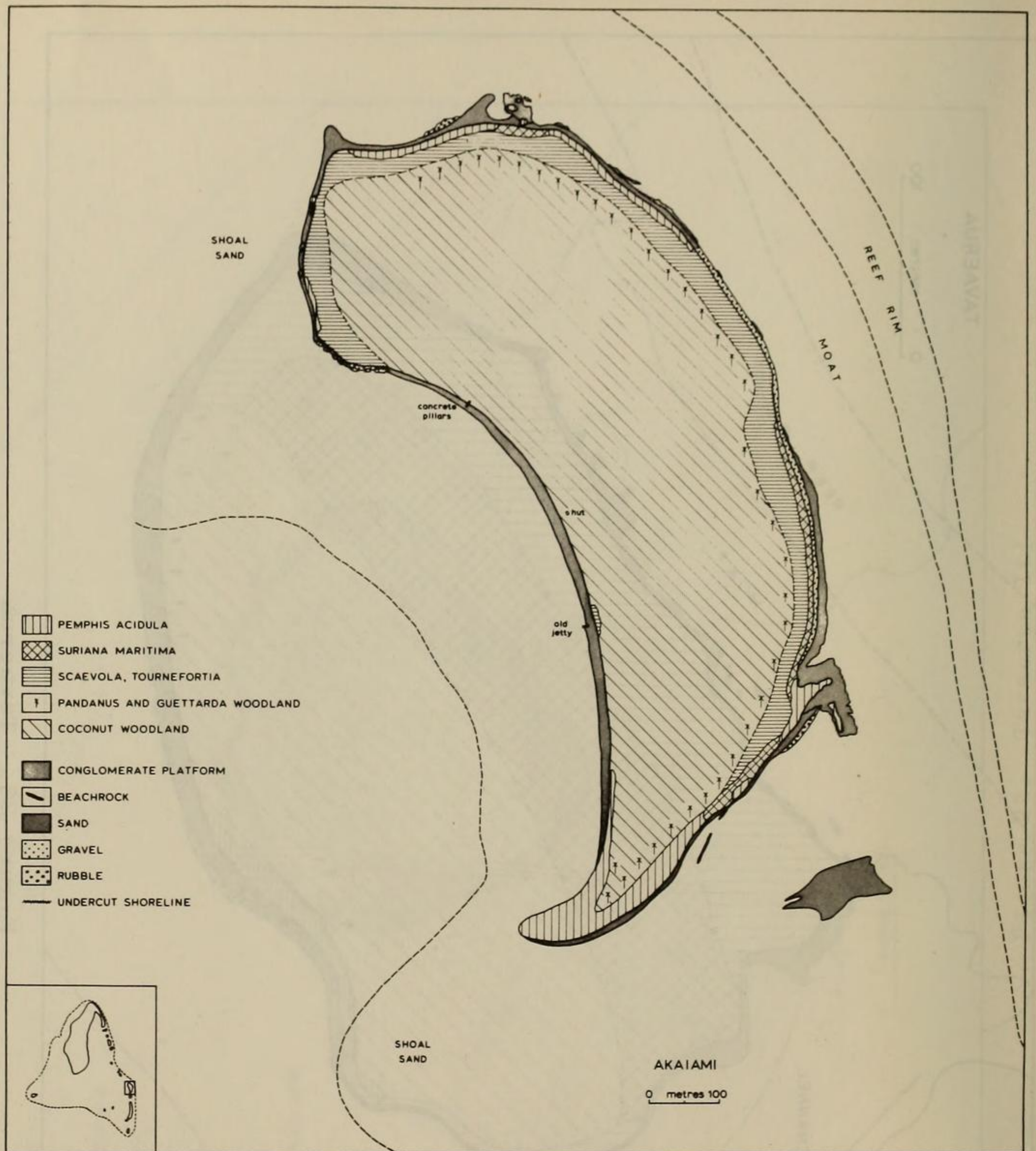


Figure 24. Akaiami



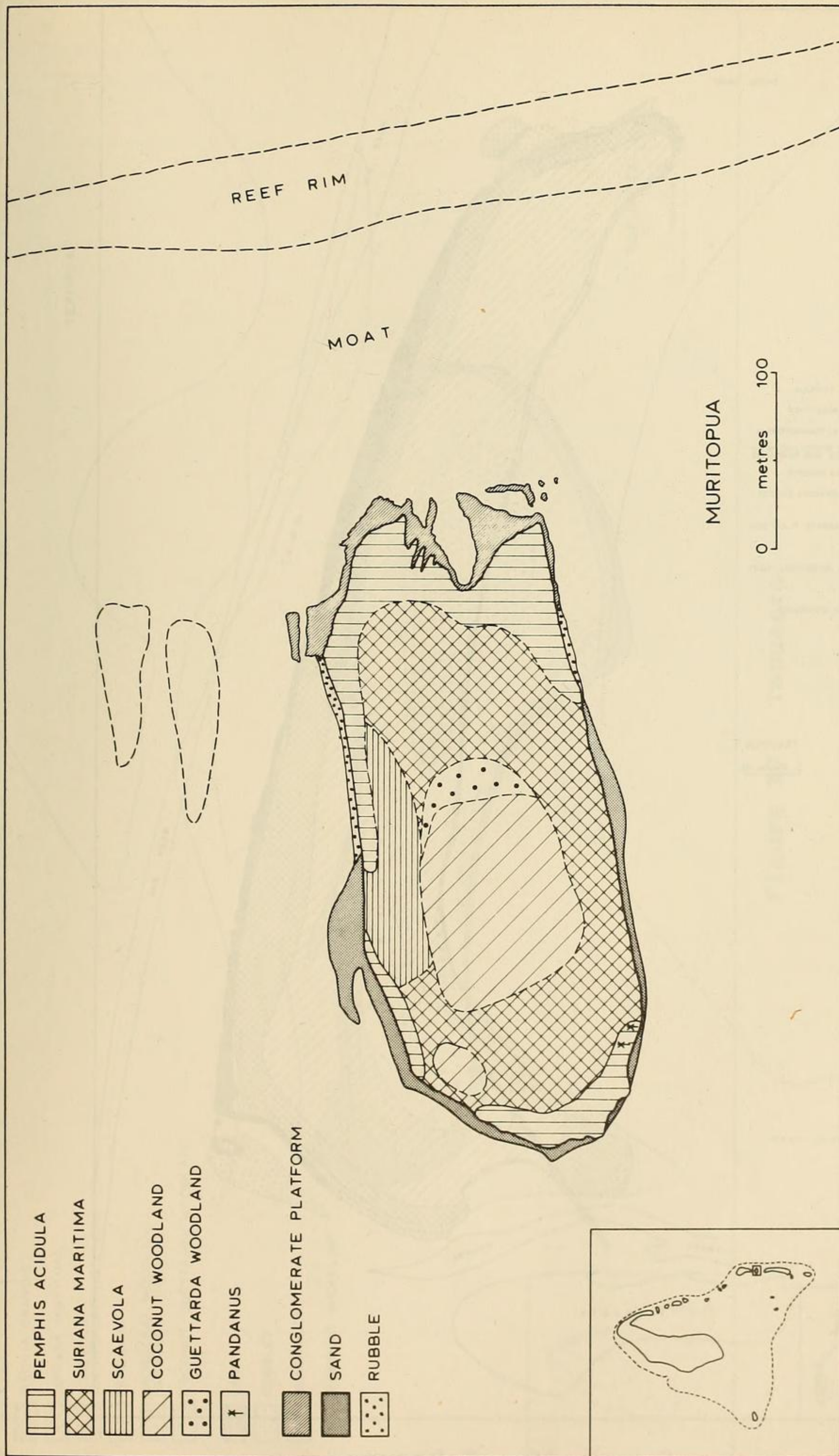


Figure 25. Muritapua



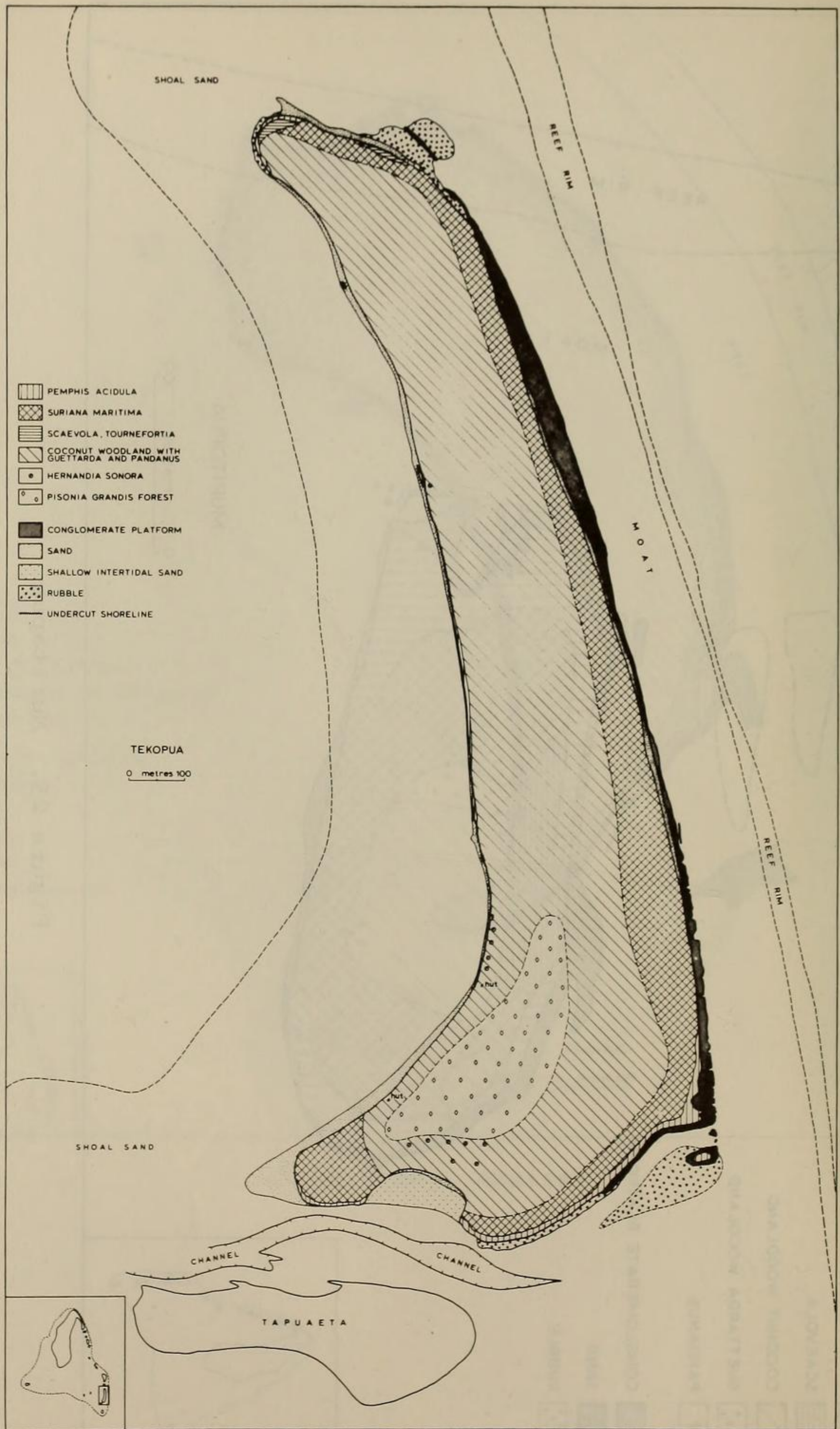


Figure 26. Tekopua



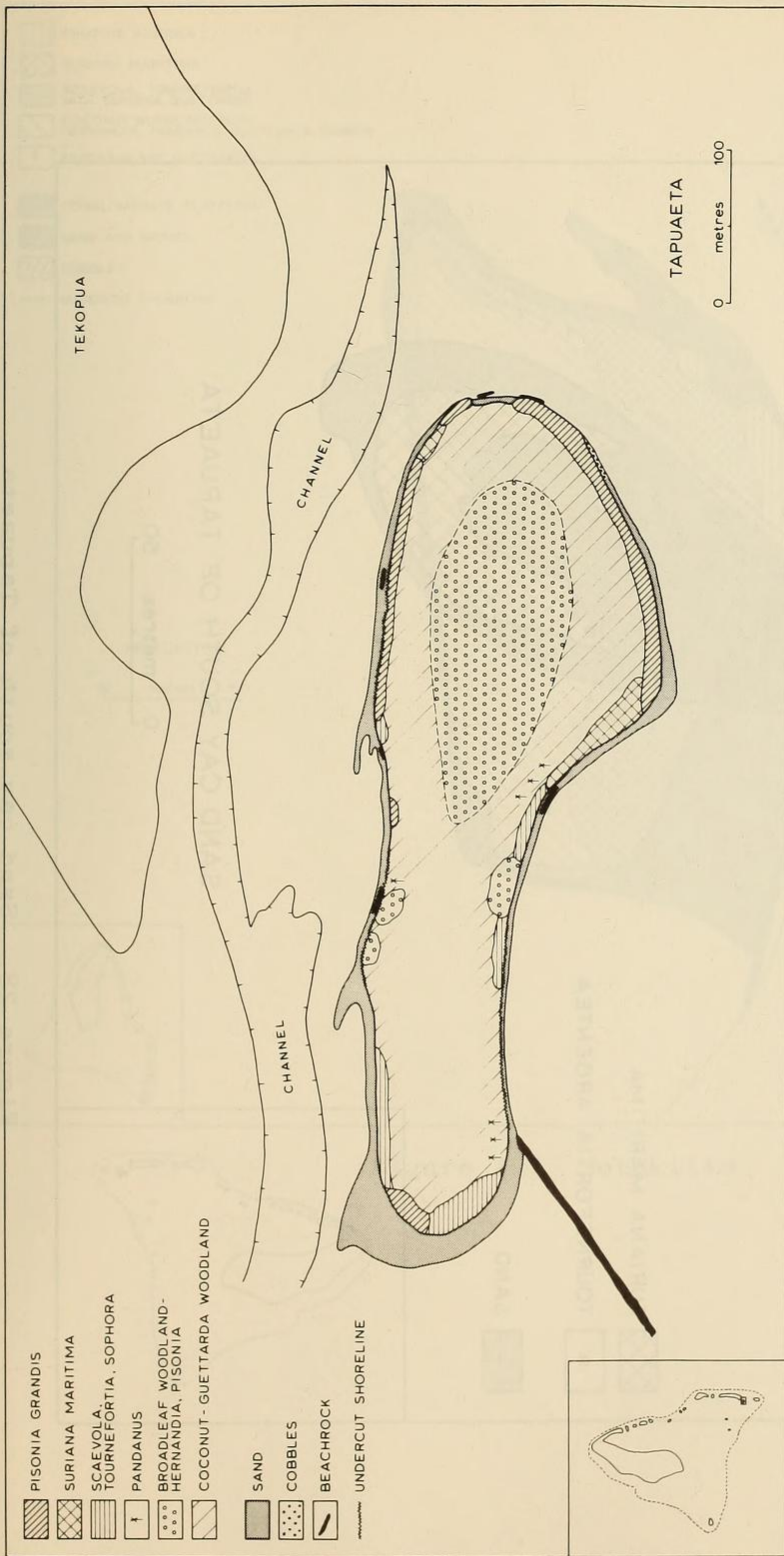
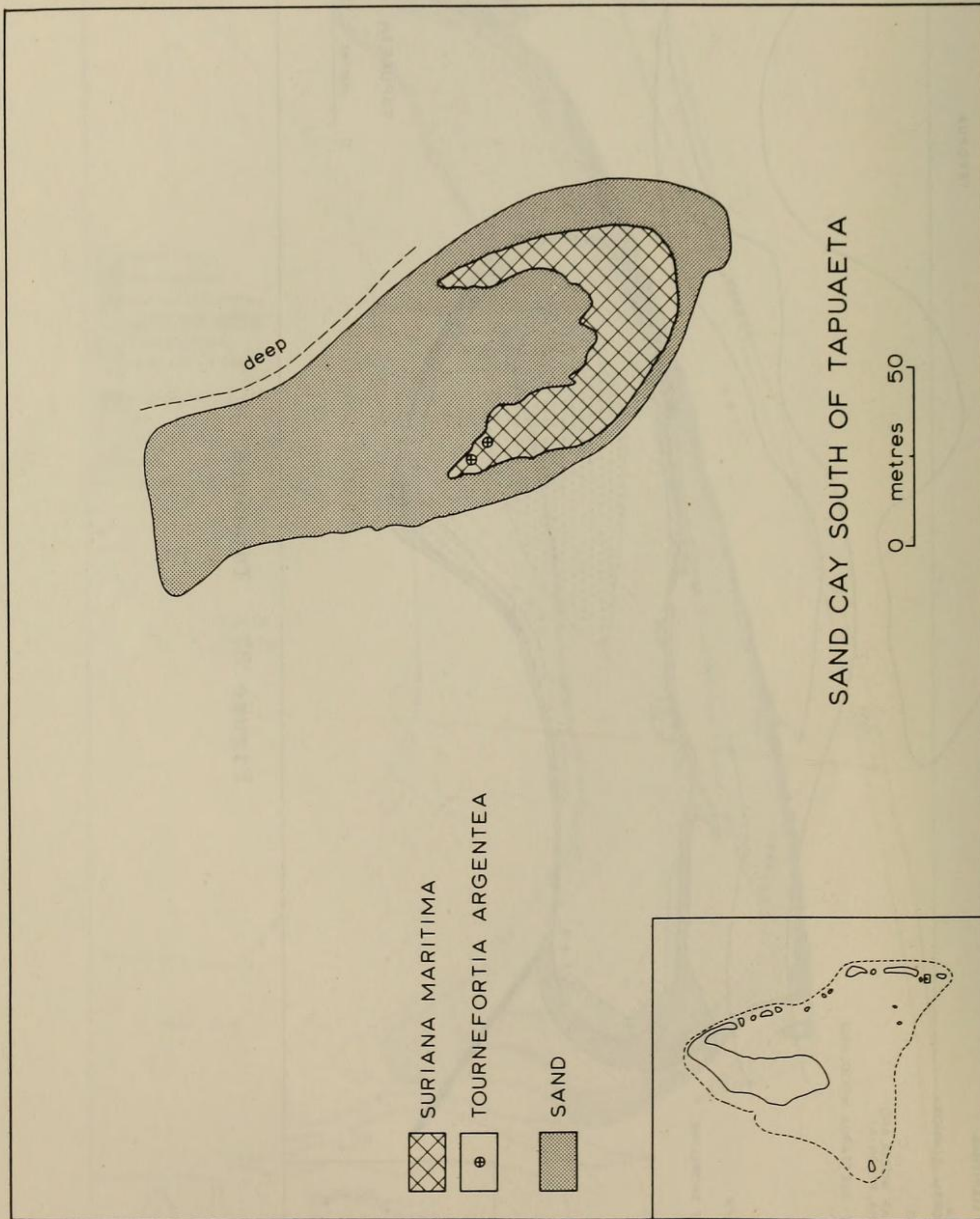


Figure 27. Tapuaeta





SAND CAY SOUTH OF TAPUAETA

Figure 28. Sand cay south of Tapuaeta



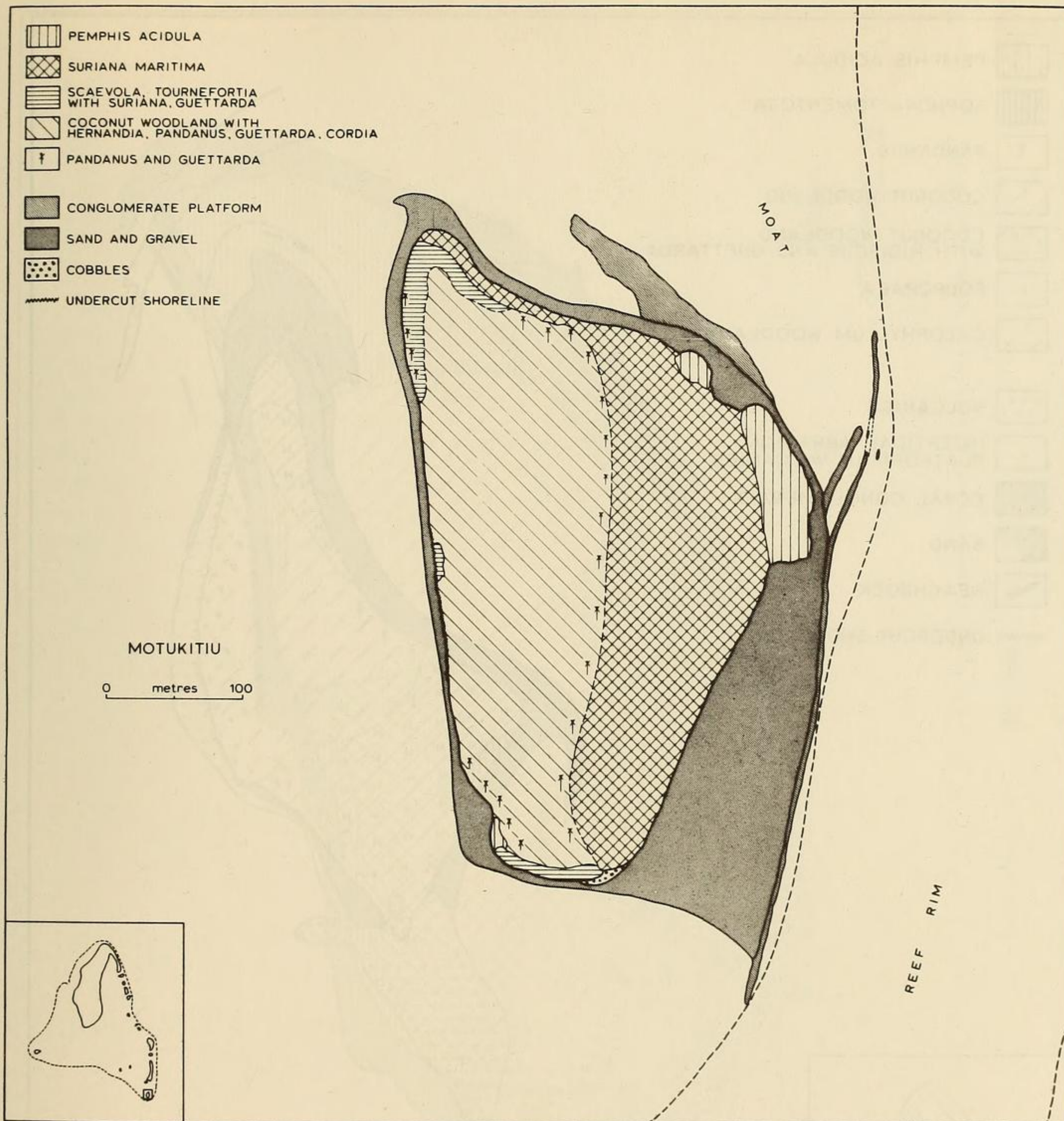


Figure 29. Motukitiu



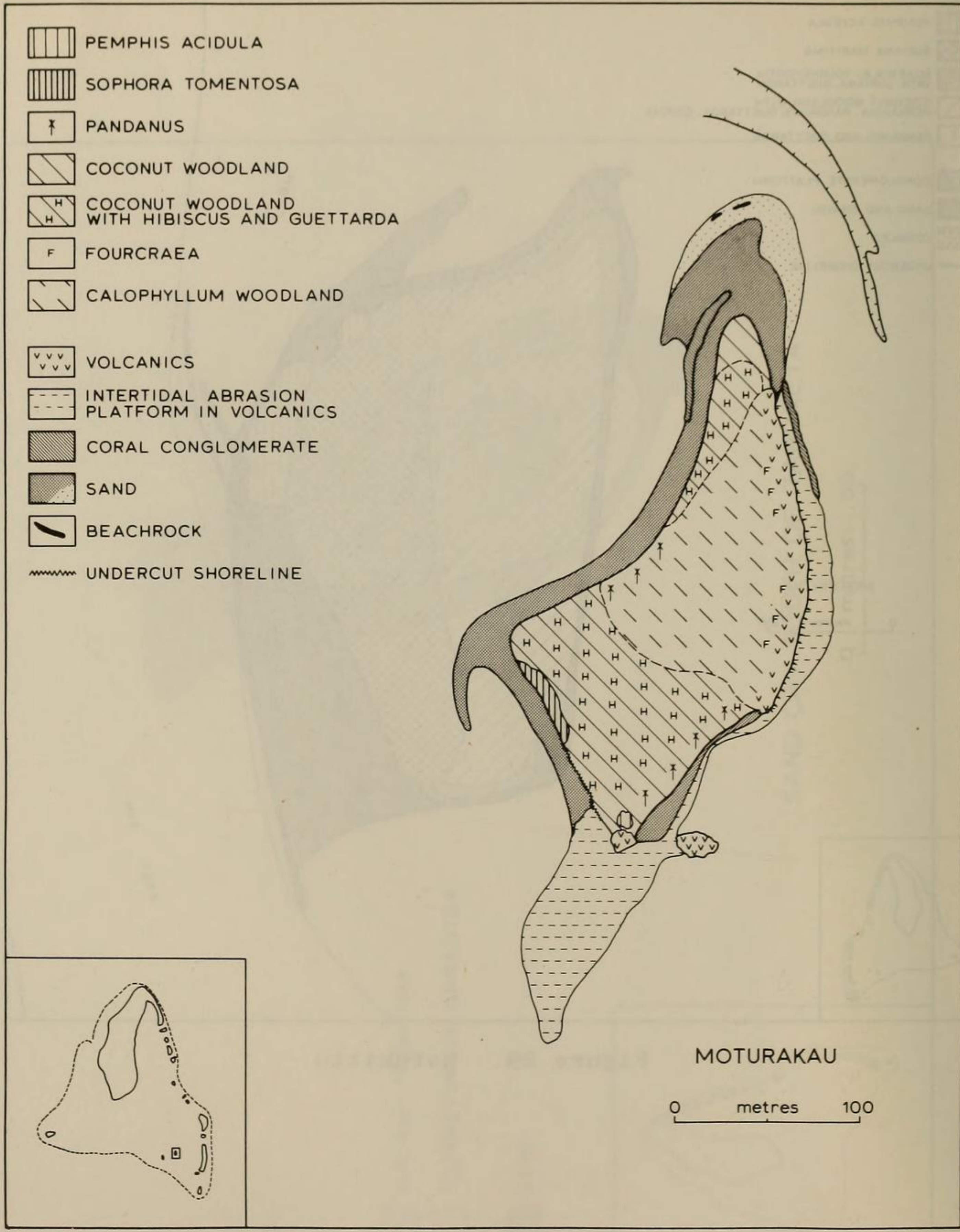


Figure 30. Moturakau



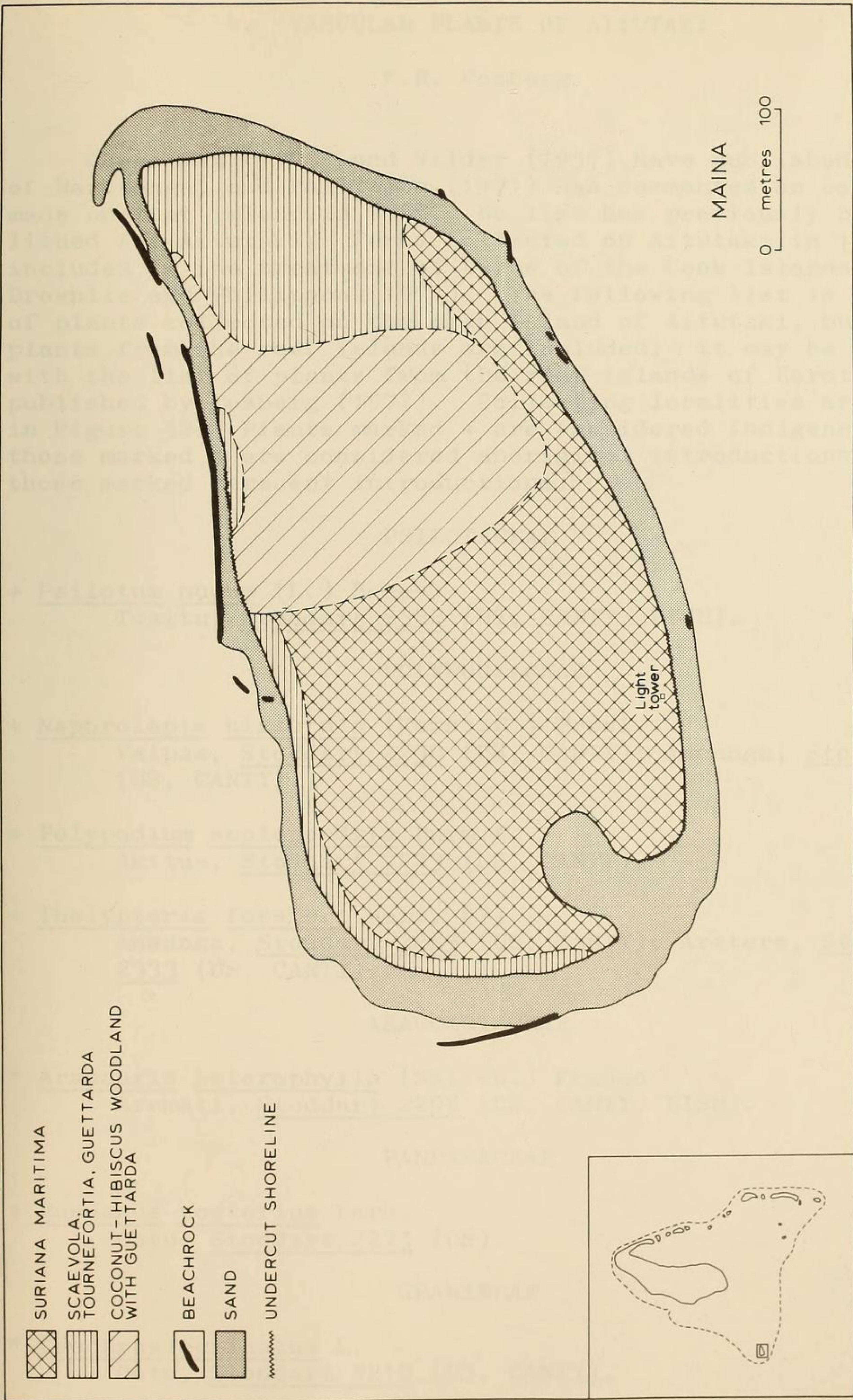


Figure 31. Maina



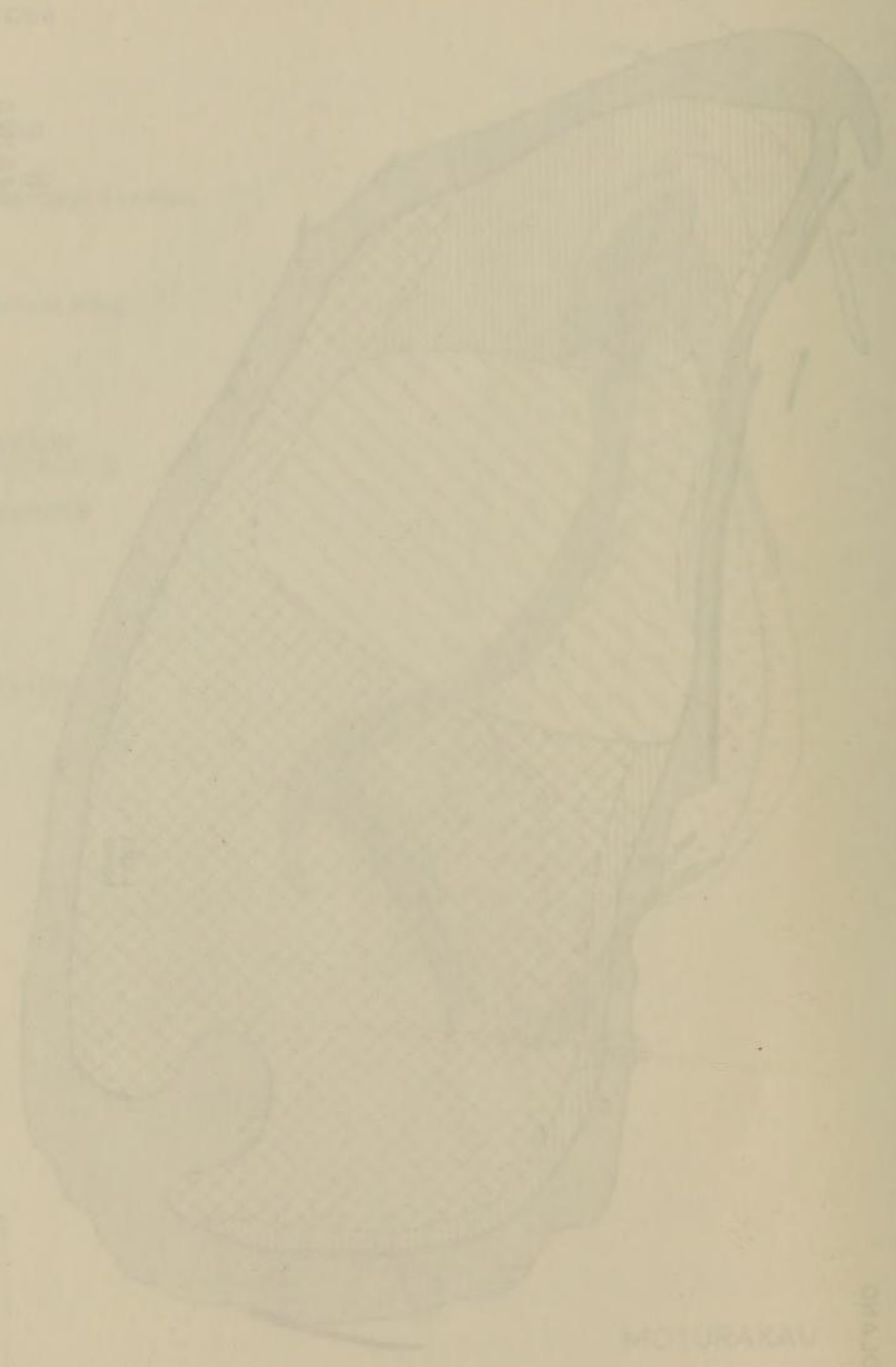
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