The Natural History of Iguanura geonomaeformis Martius: A Malayan Undergrowth Palmlet

RUTH KIEW

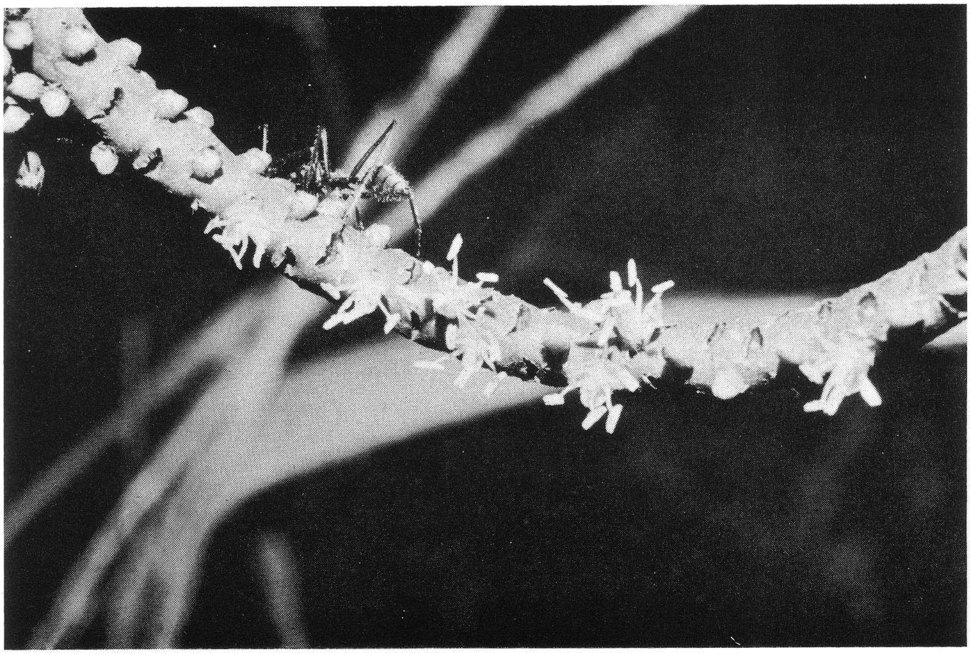
Iguanura Blume is a genus of arecoid palms endemic to the Malayan Archipelago. There are twelve species described from Malaya of which *I. geonomaeformis* Martius was the first to be described in 1845. The specific epithet is apposite, as Martius notes in *Historia Naturalis Palmarum* (1823–50) that these are "Palmae arundinaceae habitu geonomae." The geonomoid palms, however, are still much better known than their equivalent Malayan palmlets.

Iguanura geonomaeformis is very abundant in the undergrowth of lowland rain forests in Malaya and it often dominates the undergrowth, forming thickets of several thousand individuals. I looked for it in numerous forests in Malaya and only failed to find it on the limestone outcrops and mangrove swamps and on the main range above 4000 feet. This species is particularly abundant in the valley bottoms beside streams and in low-lying forest which is seasonally swampy. It is quite restricted in its habitat and unlike the other species of *Iguanura* it does not grow far from streams or on well-drained slopes. None of the species is found on dry ridge tops.

Iguanura geonomaeformis is closely related to *I. wallichiana* Hook f. from which it is only distinguished by having a simple or bifid spadix while *I. wallichiana* has a spadix with three or more branches (generally with nine or ten): the two species cannot be told apart vegetatively. Interestingly *I. geonomaeformis* is, as noted above, of very restricted habitat while *I. wallichiana* is frequently found on slopes. Mixed populations of these two species are found in central Malaya, for example in the National Park in Pahang; elsewhere the populations are exclusively of one species. *Iguanura geonomaeformis* is commonly found at and south of Kuala Lumpur and *I. wallichiana* is found at and north of Fraser's Hill.

I chose to work on *I. geonomaeformis* as it grows in the mountains behind Kuala Lumpur where the University of Malaya has a Field Studies Centre which I was given permission to use. I was able to make almost weekly observations for over a year on the populations growing there.

Iguanura geonomaeformis is a very slender thornless palmlet which seldom reaches six feet tall (Fig. 1). The stem is about one inch thick and has conspicuous annuli (circular leaf scars) at regular intervals about one inch apart; the stem is rough and the outer layers become papery when dried. The base of the stem is supported by a mass of thin fibrous stilt roots and there are often several smaller stems of varying ages sprouting from the base to form a clump of about five stems. The leaf sheaths are tubular but do not form a distinct crownshaft as seen in the elegant ornamental arecoid palms, such as *Roystonea* or *Archontophoenix* which are self-cleaning; rather the leaves do not absciss but remain rotting while hanging from the crown giving the palm a rather scruffy appearance. The leaf sheaths are very fibrous and so remain at the base of the



2. A large forest ant crawling on a spadix with male flowers open.

crown for several years. Neither does the leaf sheath form a long tight tube; it is tubular for only half its length as the thick fibrous sheaths of the successive new leaves force it apart.

The crown supports about eight to ten pinnate leaves when adult and these are generally about three feet long and one foot wide. The pinnae are only rarely regularly arranged and frequently they are of different widths. They are not in opposite pairs nor are there always the same number of pinnae on both sides of the rachis. The leaf opens a very attractive pale pink and quickly turns bronze before becoming rice-green and after about two weeks assumes a dark olive-green colour.

The inflorescences always develop and complete their fruiting among the leaves and in fact this palmlet has the habit and appearance of *Calyptrocalyx spicatus*, which is sometimes cultivated in tropical botanic gardens, except, of course, that it is very much smaller. The form of inflorescence gives its names to the genus as Blume thought it resembled an amphibian's tail (Principes 14:116, 1970; "What's in a name"). The spadix is invariably simple and sometimes narrowly bifid. The flowers are in threes (two male and one female) and are sunk in common pits which are arranged spirally on the spadix. In this species the three flowers are very rarely seen together as they develop in succession with only two flowers visible at any one time. While the first male flower is open, the second male flower is an immature bud half-enveloped in the floral pit and the female flower is embryonic and completely hidden within the pit.

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1. *Iguanura geonomaeformis* growing in its typical streamside habitat.

When the second male flower is open, the female flower is an immature bud just emerging from the pit. Towards the apex of the spadix the pits contain only male flowers. The spadix is protandrous and the male flowers are ephemeral. The female flowers seem to last longer but it is difficult to tell when fertilisation occurs until the stigmas turn black after one or two weeks. The flowering period for a single spadix lasts between one to three months. Inflorescences are produced continuously and it is not uncommon to find a plant with several inflorescences at various stages from buds to ripe fruits.

Schmid (1970) studied the pollination of a New World arecoid palm, *Asterogyne martiana*, which closely resembles *Iguanura geonomaeformis* in being a small undergrowth palm of wet lowland forest. Schmid concluded that *A. martiana* was insect-pollinated. Though no insect has been demonstrated to transfer pollen from the male to the female flowers of *Iguanura*, it is probably insect-pollinated too. When illuminated by sunflecks in the morning the spadix in male flower is covered with insects including ants (Fig. 2), which sip the liquid (which could be nectar) at the petal bases; flies, bees and wasps gather the pollen; and weevils seem to consume the stamens. The female flower attracts fewer insects: ants, for example, seem to sip the floral liquid.

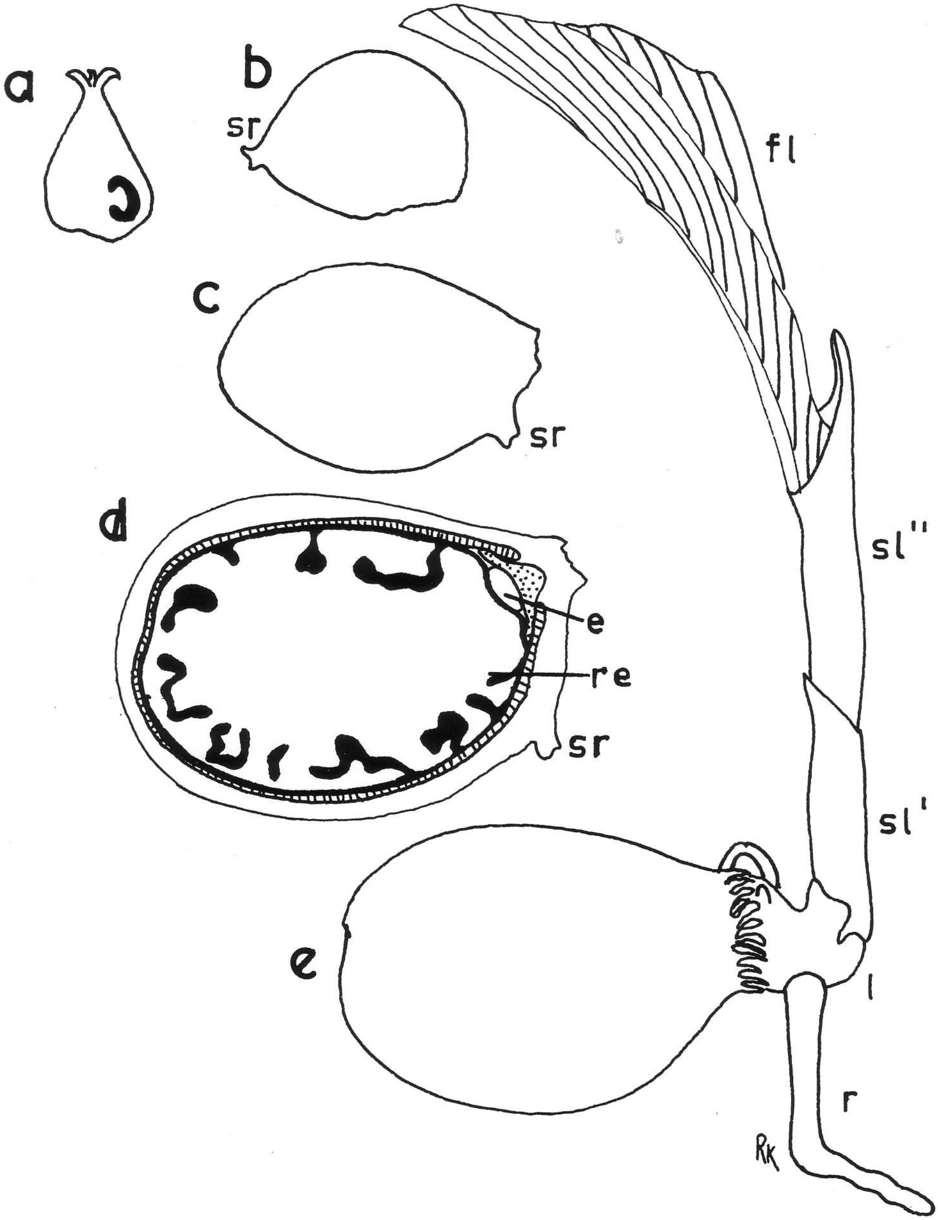
Fruit development after pollination is slow and it takes about six months for the fruit to reach maturity. The ripe fruit resembles a cherry as it is cherry-coloured, globose and has a soft sweet outer layer. The style-remains are basal and it is interesting to watch the development of the fruit as the style-remains are manoeuvred into a basal position by unequal growth (Fig. 3).

The fruit is about ⅜ of an inch long and inside the soft outer layer is a very tough fibrous mesocarp which encloses a seed with its solid ruminate endosperm. The fruit is probably attractive to birds, just as the cherry is, but I have never seen birds taking the fruits; this is not surprising as the jungle birds are very shy. However the seedlings are never far from the adults and are often found in clusters very close to an adult which suggests that most fruits just fall from the spadix to the ground or are pecked off by birds.

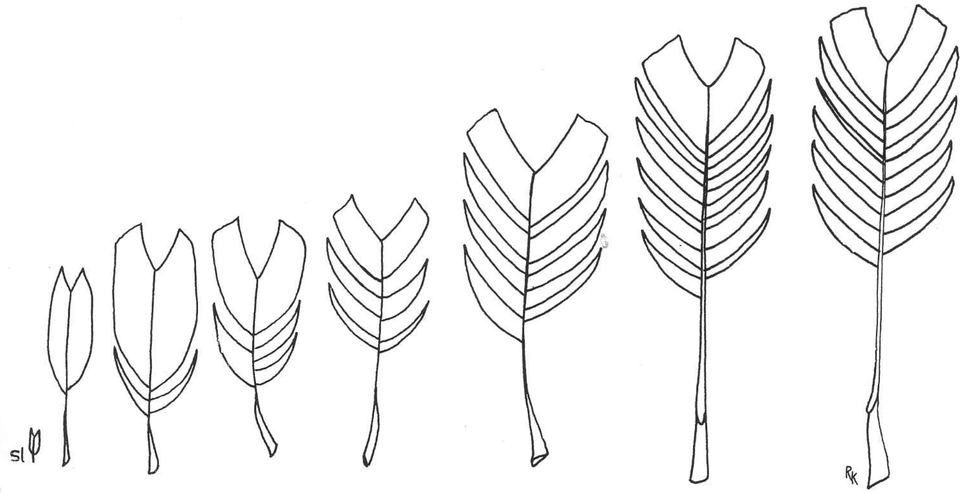
The embryo at this stage is minute—about the size of a pinhead—and is very immature which explains why the seed takes so long to germinate (about two months). The viability is very high, at least 60 percent. Germination very closely follows the pattern for *Areca* (Corner 1966) and *Archontophoenix* (Tomlinson 1960). After about six months, during which the two scale leaves are produced, the first seedling leaf opens, by which time the cotyledon completely fills the mesocarp cavity (Fig. 3).

The first seedling leaf is simple and the plant grows a succession of simple leaves which become larger and pinnatisect at the base until the final adult pinnate leaf is attained (Fig. 4).

In plants with a self-cleaning stem it is relatively easy to measure the rate of growth of the palms by marking the base of the crownshafts as Tomlinson (1963) suggests. However with palms without self-cleaning trunks it is necessary to observe the apical leaf which projects like a rapier from the apex. It was easy to measure the rate of elongation of the sword leaf as these little palms were within my reach and I made almost weekly records. Several interesting points came out of this. The adult pinnate leaves, with a final length of up to three feet, took about six to seven months to emerge from the enclosing apex and to elongate and then open and they



3. Fruit development and germination of *Iguanura geonomaeformis*. a, mature pistil in vertical section × 7; b, young fruit about one month after pollination × 7; c, young fruit about two months after pollination × 4; d, mature fruit in vertical section about seven months after pollination × ⅓; e, seedling about one month after germination × ⅖. sr, stylar remains; e, embryo; re, ruminate endosperm; fl, foliage leaf; l, ligule; sl, scale leaf; r, radicle.



4. A series of leaves from seedling leaf (sl) to the adult leaf form × 1/15.

elongated at a rate of about one inch a week, while the juvenile simple leaves, about one and a half feet long, took at least one year to elongate and open and the leaf elongated at a rate of a third of an inch a week. Since the leaf spends an almost equal time developing in the apical cone as it does elongating as the sword leaf (Corner 1966) it takes one year for an adult leaf to develop completely and two years for the juvenile leaf.

It is very interesting and not wholly expected that these small leaves grow so very much more slowly than the large adult ones. It could be that during the juvenile stage the plant is slowly building up an apex of the final adult size of the stem and increasing the number of leaves in the crown from the single seedling one to eight or more in the adult crown, with a much smaller leaf area for photosynthesis and a less well-developed root system than the adult. Once the adult stage is reached the plant has a good root system and a large photosynthetic surface and so can maintain a steady and more rapid rate of growth.

For the trunked plant it is relatively easy to assess the age of the trunk; since each annulus represents one leaf, one can make a rough assessment that the time of expansion between one leaf and the next is the age represented by each internode. Hence in *I. geonomaeformis*, since the leaves are produced at six-monthly intervals, each annulus adds six months to the age of the trunk. The problem comes in assessing how long it has taken for the palm to begin to form a trunk. I was only able to observe these palms for about a year and hardly saw one juvenile leaf from its first appearance to the final opening stage so that it is difficult to estimate how long it takes. In some arecoid palms, for example in the nikau palm (*Rhopalostylis sapida*), it takes about twenty years for a trunk to be formed and this palm produces adult leaves at a steady rate of three a year (Esler 1969). I think that in these small palms it is probably less, perhaps about ten years, as the final size of the apex is so much smaller.

If this is so it is possible to count the annuli and halve it in the case of *I. geonomaeformis* and add ten years for the juvenile palm stage to get a rough idea of an individual's age. The maximum number of annuli I have counted is 182 which makes the palm about 100 years old, a surprising age for these tiny palmlets. Individuals with about 100 annuli (about 60 years old) are by no means rare but the majority of the populations have about 25 annuli (about 22 years old).

In every population I examined, quite a high proportion of the population (15%) was represented by seedlings and the remainder of the population ranged from the juvenile to the adult, so that these populations show no indication of declining. Another reason for their success is that the suckering habit makes this palm potentially immortal. The tallest stem, when it dies off, is replaced by the several palmlets at the base.

An important consideration in Malaya is the rate at which the forests are being cut down and how much of the forest on the highly populated west coast has already been very disturbed. I visited several such sites. In places where *I. geonomaeformis* has been totally exposed to full sunlight, such as in clearings and on logging tracks, it and other undergrowth palms such as *Pinanga* and *Licuala* were completely bleached. In other areas where the forest had been drastically thinned out the older leaves were yellow and necrotic but the larger crowns formed enough shade for the smaller palms and seedlings which showed no signs of yellowing. It seems that in these conditions this palm would be able to survive and even compete with the rapidly growing plants which are characteristic of secondary forest. It has been frequently noticed that these forest palmlets are not found in secondary jungle and it has been supposed that this is because they are too tender to survive the presumed tough conditions prevailing in these forests. However palms such as *Licuala* and *Pinanga* have been taken from their natural forest conditions and when grown from seed they can adapt to shady parts of Botanic Gardens all over the tropical world where the humidity is probably much lower and the temperature much higher than in secondary forest. Because *Iguanura* can survive for a long period in very disturbed forest I think that this indicates that when the palm has been wiped out during the sunny phase following the drastic clearing of primary forest or was never present there, it stands a very low chance of recolonizing because its dispersal is not at all efficient. Indeed it is remarkable in the jungle itself that while one valley supports a very dense population of *Iguanura* the next valley may be devoid of it although ecologically it appears identical. This points to poor dispersal mechanism in the genus.

It has sometimes been implied by authors (for example, Corner 1966) that these small forest palmlets, and particularly those small almost herblike neotenic forms with simple leaves, also have the herb character of rapid growth and a rapid turnover of individuals. I hope that this account provides some evidence against this by drawing attention to the particularly slow growth of the juvenile acaulescent stage. No doubt part of the success of these undergrowth palmlets is due to their slow growth which may be a factor involved in the exploitation of such a gloomy environment and survival in deep shade and that their long life allows them to produce fruit over a long period of time, thus ensuring some survival of these palatable fruits. Slow growth and long life may have helped to make them successful in the forest but may also be the cause of their demise in the future when the forest is cut down and adaptation or an adequate dispersal mechanism for recolonization is a prerequisite of survival.

Iguanura has no commercial value, although the aboriginal people in Malaya are said to eat the fruits and use them as inferior betel nuts and to make walking sticks from their stems. Of *I. wallichiana*, M. V. Alvins in 1884 reports he was told by the aboriginals "Anybody don't wished their wife to be confined, they shall eat their roots and flowers." I wonder how reliable this information is but Burkill (1935, 1966) in his dictionary accords this contraceptive value to *I. geonomaeformis.*

None of the species of *Iguanura* has been taken extensively into cultivation although there are a few individuals at the Botanic Gardens at Penang, Singapore and Bogor (Indonesia), where they survive and even fruit in deeply shaded areas near water. Transplanting is not successful but I have found that they will germinate readily from seed and I have healthy seedlings in the tropical houses at the Cambridge University Botanic Gardens grown from seed that I sent by air from Malaya.

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LETTERS

The following letter may be of interest to readers who grow *Howeia.*

GOLETA, CALIF.,
November 30, 1971

Honorable Chairman
Lord Howe Island
Board of Control
Chief Secretary's Building
121 Macquarie Street
Sydney, Australia, N.S.W.

DEAR SIR:

In November 1971 I had the opportunity to spend six days on Lord Howe Island. The purpose of my visit was to inform myself of the natural habitat of the four species of *Howea* palms indigenous to the island. Deigaard Nurseries have grown these palms for the last twenty years as a main operation of their wholesale nursery activity.

At the same time, I tried to find the reason for the continued shortage of seeds and rationing of our orders.

Introduction of artificial (plastic) ornamentals into the decorative market has not proved effective, on the contrary the market for natural *Kentia* palms has increased by leaps and bounds. Today we are faced with the fact of insufficient supply to fill the yearly increasing demand all over the civilized world.

These are my observations derived at during my recent visit: please rest assured that they are not meant as criticism or hasty judgment; on the con-