The Reef Corals *Lithactinia* and *Polyphyllia* (Anthozoa, Scleractinia, Fungiidae): A Study of Morphological, Geographical, and Statistical Differences

**Austin E. Lamberts**

**ABSTRACT:** The taxonomy of the Indo-Pacific reef corals *Lithactinia* and *Polyphyllia* is analyzed. They differ morphologically in that *Lithactinia* has one founder calice and no significant secondaries and has a lighter construction. A study of base area to weight ratios shows a significant difference, $P < .001$. They have a mutually exclusive geographical distribution. These data suggest that each is a valid genus.

**THE SCLERACTINIAN CORAL GENUS POLYPHYLLIA**

is represented in most major coral collections and is well known. It is widespread in the Indo-Pacific tropics, often rare, seldom common, and never abundant. Because these are free-living colonies found in shallow waters, the coralla were easily collected and transported and so are represented in many early descriptive works. Rumphiuss' (1750) specimen *Fungus saxaeus oblongus* may have been of this genus, and Seba's (1758) *Marine taupe* certainly was, although it was not mentioned by Linnaeus (1758), whose coral specimens were largely from the Caribbean.

I have reviewed the literature on *Polyphyllia* and allied genera, and have examined many specimens so designated from many different geographical locations in situ and in various museum collections. Veron and Pichon (1979), in their monograph, conclude that *Polyphyllia* is a variable genus which "it is widely agreed" includes *Cryptobacia* and *Lithactinia*. This study was to verify or disprove that assertion.

**HISTORICAL REVIEW**

With the opening of the Pacific and the China trade in the eighteenth century came a

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1 Manuscript accepted 29 August 1983.

2 1520 Leffingwell, N.E., Grand Rapids, Michigan 49505.
New Ireland on whose reefs he collected it in 1823. Within the decade Quoy and Gaimard (1833) returned to France with a coral collected in the same general area that they referred to as Polyphyllia pelvis. They questioned whether it was related to Fungia talpa Lamarck (1816) but equated it with L. novae-hiberniae of Lesson. Their description aptly fits novae-hiberniae as does their figure (pl 52, 9–10); however, their figure 8 appears to show the lamella they describe as perpendicular to the central sulcus as actually being parallel, suggesting that the artist may not have had the specimen in hand when the drawing was executed. I believe the illustration, however, is of a Lithactinia and not of a Polyphyllia.

The literature presents a publication paradox. Quoy and Gaimard used the genus designation Polyphyllia in describing P. pelvis in 1833. They refer to de Blainville (1830) thus—“This genus which was established by mm. Quoy and Gaimard”—who in turn cites their (Q and G) 1833 publication in his bibliography. De Blainville gives no explanation as to how he acquired these data three years before they were officially published. He lists P. pelvis, P. talpa, and four species of his own which he neither described nor figured. These specimens have been lost. De Blainville’s illustration of Polyphyllia is apparently copied in part from Quoy and Gaimard. The remaining figure is of Lithactinia, similar to Lesson’s pl 16, figure 3. Ehrenberg (1834) recognized P. talpa and attributed it to Quoy and Gaimard. He added P. sigmoïdes which he equated with Seba’s Marine taupe, and P. leptophylla, which from his description is not distinguished from P. talpa.

Dana (1846), in a comprehensive review, arranges the Polyphyllia thus:

I. Medial interrupted series of orimes
   (1) P. talpa          (3) P. sigmoïdes
   (2) P. leptophylla   (4) P. pelvis

II. Orimes very distinct
   (5) P. fungia

III. Orimes indistinct. No medial series
   (6) P. pileiformis    (7) P. galeriformis

In his text he refers to the species of both Lesson and Quoy and Gaimard as P. pelvis, which he believes akin to P. talpa. He described a new species, P. fungia, saying the specimen was at the Academy of Science in Philadelphia. He gave no figure, and the original specimen has apparently been lost.

Dana, who was a field naturalist, illustrated a live Polyphyllia pileiformis (from the Latin word for mole), its skeletal characteristics, and those of a closely related P. galeriformis (from Latin galerum, bonnet or helmet). He cited Lesson and Quoy and Gaimard and recognized the similarity among all the species, but failed to see that all the specimens he studied had been deformed by secondary growth, an observation which would have been apparent had he had an unbroken specimen.

Milne Edwards and Haime (1860) contrived the following scheme to accommodate what they believed to be three closely allied genera:

I. Cryptobacia: Central calices arranged in a distinct line, many secondary centers with clearly radiating septa. Type species C. talpina (Lamarck 1801) = talpa (Lamarck 1816).

II. Polyphyllia: Calices are of two sorts, central ones are in a line and “subradiate,” while secondary centers are indistinct and do not radiate. Type species P. pelvis Quoy and Gaimard.

III. Lithactinia: All calices of one kind. No radial arrangement. Type species L. novae-hiberniae Lesson.

John Wells (pers. comm.) succinctly summarizes:

The dates of publication of new genera and species must be adhered to, thus: Polyphyllia Quoy & Gaimard in Blainville 1830, Lithactinia Lesson 1832, and Cryptobacia Milne Edwards & Haime 1849. Polyphyllia had two syn-types: P. pelvis Q & G in Blainville 1830 and P. talpa Lamarck (= P. talpina Lamarck 1801). In 1849 M. E. & H. made P. talpina type by monotypy of their Cryptobacia, hence P. pelvis became type of Polyphyllia (M. E. & H. figured P. pelvis), and kept Lithactinia separate. In 1909 Gardiner in his revision of the Fungiidae gave good reasons for putting P. pelvis in P. talpina and then chucked in Lithactinia n-h. for good measure. I followed this consolidation in my paper on the Fungiidae before I had seen a proper specimen of L.n.-h., but Lithactinia may be a distinct genus.

Meanwhile, Duncan (1884) erected the alliance Herpolithoida with our similar colonial
Fungiidae which had some calices incomplete and nonradiating. This included Herp­politha, Polyphyllia, Lithactinia, and Zood­pilus. Gardiner (1909) based his conclusions on the examination of seven specimens he determined were P. tulpina and four specimens described by Quelch (1886) as Lithactinia, which, although all showed secondary regrowth, he dismissed by saying “there is no adequate figure of any other specimen supposed to belong to Lithactinia.” He did not alter species designations.

Folkeson (1919) described Polyphyllia produc­ta on the basis of one specimen found off Cape Jaubert, E. Australia. Boschma (1925) gave measurements of 15 specimens of P. tal­pina he had examined and concluded that P. produc­ta was a variant of P. tulpina. Wells (1956) retained the classification of Gardiner, as mentioned, and observed (1966) that the septocostal structures of the subgenus Fungi­a (Pleuractis) are comparable to the structures of Herp­politha, Polyphyllia, and (Q.E.D.) Lithactinia, putting them together in an evo­lutionary grouping. The last collection report available with complete synonymy is Veron and Pichon (1979). They list in “material studied” 24 specimens from six locations all within the Great Barrier Reef Province.

MATERIALS

Approximately 90 corals labeled Polyphyllia were examined for this study. These include: my collection (AEL) 12; Bernice P. Bishop Museum, Honolulu, Hawaii (BBM) 2; Museum of Comparative Zoology, Harvard University (MCZ) 7 (including four of Dana’s syntypes); Rijksmuseum van Natuurlijke Historie, Leiden (RMHS) 42; Museum National d’Histoire Naturelle, Paris (MNHN) 1 (Lamarck’s specimen); United States National Museum, Washington, D.C. (USNM) 22 (including two of Dana’s syntypes); John W. Wells Collection, Ithaca, N.Y. (JWW) 5.

METHODS

Methods used were similar to those outlined for a previous study on Astreopora Lamberts (1982a). More than 100 Indo­Pacific reefs were surveyed with underwater gear and the presence of fungid corals noted. Appropriate voucher specimens were labeled with numbered plastic tags, cleaned, and data entered in a sequentially numbered data book. Collection data included date, water depth and quality, current flow, underwater appearance, substrate, and general composition of the reef with percent coral cover. When possible a list of the genera and species identified gave the following informational numbers:

1. Abundant when dominant or found everywhere.
2. Common, 10–50 seen in an hour’s dive search.
3. Occasional, 3–9 in an hour’s search.
4. Rare, 1–2 per hour’s search.

At time of classification, data from each specimen were recorded with the following additional data:

1. When possible an outline of the base covered by the specimen was measured in cm². The specimen was weighed on a precision balance.
2. Transillumination for obvious préfor­rations.
3. Calices in central sulcus counted.
4. Secondary calices, primary septa, den­tations, and so on evaluated.
5. Undersurface, attachment scars, and so forth, noted.
6. In a few specimens, volume was es­timated by displacement of 2 mm plastic spheres.
8. Final diagnosis.

ECOLOGY

Vaughan and Wells (1943) in their revision of the Order Scleractinia included factors other than skeletal elements such as form of corallum, colony formation, and physiology. Their generic classification, however, is based primarily on the formation of the skeletal septa. Wells (1966), in a study of the evolution
of fúngid corals, emphasizes the microscopic similarity among the various groups and surmises that each of these groups may have had a common ancestor. One such alliance includes *Fungia* (*Pleuractis*), *Herpolitha*, *Polyphyllia*, and, by inference, *Lithactinia*. These corals are found only in the tropical Indo-Pacific but do not have the same geographical distribution. Of the four, *Pleuractis* has the widest distribution and *Lithactinia* the most restricted (Figure 1).

*Fungia*, *Herpolitha*, and *Polyphyllia* have been reported from many localities in the Indian Ocean south to the Tulear, Malagasy reefs (Pichon 1974) and North West Cape, West Australia (Wilson and Marsh 1979). The north limit is the Okinawa area (Yamazato et al. 1978). They are found south to Heron Island, including the Barrier Reef Province (Veron and Pichon 1979). The known eastern range of *Polyphyllia* is Ponape, Caroline Islands (Ma 1959). Both *Fungia* and *Herpolitha* are found east to the Tuamotus (Wells 1954), but only *Fungia* has been reported from the Hawaiian chain. *Lithactinia* has New Ireland as both its north and west limits, with New Caledonia and Tonga as the southern and American Samoa as the eastern limit.

*Fungia* (*Pleuractis*) *scutaria* Lamarck 1801 is the most abundant species of that subgenus and has been studied extensively in Hawaii where it is the only *Fungia* found. Its biology, general behavior, and reproductive strategies are probably similar to other members of the alliance, and I am presuming that it will serve as a model for all. It occurs widely, but in places other than Hawaii where *Fungia* with similar growth niches are found, it is usually rare or uncommon (Lamberts 1983).

*Fungia scutaria* is found on a sandy or rocky substrate in openings among general reef growth. These corals may be solitary or may occur in aggregations of hundreds of individuals. No gametes or planula larvae have been reported from any member of this group, but small developing *F. scutaria* in the early anthocaulus stage are occasionally found. Often many of these are found arising from an ancient corallum of that species. I have not been able to determine if these always arise from the living tissue of a severely stressed adult or if the *Fungia* skeleton is only a “preferred” substrate. Other corals such as *Leptoseris* have similar habits (Wells 1972). *F. scutaria* can right itself when overturned but appears to lose this capacity when it reaches its maximum size of about 20 cm length (1 kg). On one occasion I turned one member each of 15 matched pairs in a protected deep reef opening in Kanehohe Bay, Oahu, Hawaii. A week later 7 of the 15 had righted themselves but these only included the smaller ones under about 15 cm. Larger, heavier corals eventually lost their zooxanthellae and later died. Smaller specimens can migrate slowly over sand in an aquarium covering a distance of several cm a day. Specimens of *F. scutaria* are commonly found with tentacles extended during daylight hours.

Because *Herpolitha* has not been reported from areas where it might be expected does not mean it is not present. When I surveyed 14 reefs near Semporna, Sabah, East Malaysia, I systematically searched for an hour using only a face mask and found an average of 34 scleractinian genera per reef. The highest number on any one reef was 45 genera with a total of 57 genera in the area. *Herpolitha* was rare but present on eight, absent on four, and common on two, as were many other fúngids. *Herpolitha* is found on semiprotected to protected reef slopes and in slightly deeper water than *F. scutaria*. It is polystomatous with a cluster of tentacles about each opening. The tentacles are merely an inflation of the membrane over the lamella around each mouth. Dana (1846) records that in some species the general tint is umber with a sprinkling of bright green. *Herpolitha* can attain a large size. Pichon (1974) gives the average or maximum as 50–60 cm.

The genera *Polyphyllia* and *Lithactinia* do not appear to have a territorial overlap, but there are virtually no reports from regions where they both might occur. *Polyphyllia* is common in certain areas of the Great Barrier Reef Province (Veron and Pichon 1979). I found it to be abundant off Mactan, Philippines, in an area where coral was harvested commercially for export. In Semporna, Sabah, I found it rare in 6 of 14 reefs, occa-
Lithactinia and Polyphyllia—LAMBERTS

The Reef Corals

The following characteristics of *Fungia*

deduced from sand still clinging to them that they had been picked off a sandy bottom. The *Lithactinia* I collected were all found on sand between coral mounds at depths of 2 m in still water. Individuals in one cluster of five found in Sandfly Passage, Florida Island, Solomon Islands, were within 1 m of each other and 10 m from all other coral. All were of a uniform brown color with profuse tentacles all extended in bright noon sunshine. The nearby reefs had many colonies of *Stylophora* but few *Acropora*, *Montipora*, or *Pocillopora*. I recorded no other fungids on those reefs.

SYSTEMATIC DESCRIPTIONS

This group of corals has the following systematic classification:

Order Scleractinia Bourne 1900
Suborder Fungiina Verrill 1856
Superfamily Fungiicaceae Dana 1846
Family Fungiidae Dana 1846

There are seven genera (Wells 1956). Of the four groups being studied *Fungia* (*Pleuractis*) and *Herpolitha* have more than one species each; here only the most common will be presented. The following characteristics are common to all: solitary, usually colonial, hermatypic, discoidal, or elongate oval. Oral surface convex. Colony formation by incomplete intratentacular polystomodeal budding. Walls synapticothecate, commonly secondarily septotheccate or thickened. Septa numerous, fenestrate in early stages, later perforate or solid, composed of a single fan system of compound trabeculae producing simple or compound marginal dentations, laterally united by stout compound synapticulae. Axis of trabecular divergence horizontal in ephelic stages. Costae continuous or broken up into spinose projections. Columella trabecular and feeble. Dissepiments absent. Epitheca only in early epiblastic stages. Calices of two kinds; one series in central sulcus and secondary lateral ones. Septa and costal rays alternately thick and thin. Tentacles often out in daytime. Shallow water.

The following characteristics of *Fungia*

...
(Pleuractis) apply to all of this group (Wells 1966),
1. elongate corallum;
2. fine septal dentations evenly spaced, 0.5–1.0 mm;
3. costae reduced to rows of small, lightly spinose or tuberculose spines; and
4. perforate wall.
Distinct differences among these genera include:
1. number and characteristics of central calices;
2. character of secondary calices and septa;
3. differences in geographical distribution which have already been discussed; and
4. differences in coenosteal buildup giving a much heavier body weight to specimens in some genera.

Fungia (Pleuractis) Verrill, 1864

Fungia scutaria Lamarck, 1801. This species is well described by Gardiner (1909) and Veron and Pichon (1979) and will not be repeated here.

Herpolitha Eschscholtz, 1825

Type Species: Herpolitha limax (Houttuyn, 1772).

Figure 2

**FIGURE 2. Herpolitha limax showing septa, ×1.5 (AEL 405).**

**FIGURE 3. Polyphyllia talpina:** Lamarck’s specimen no. 77, ×½ (MNHN).

Characters: As described by Veron and Pichon 1979.

Polyphyllia Quoy and Gaimard 1833 in Blainville 1830

Generic Synonymy: Fungia Lamarck, 1801 (pars), Oken (1815) (pars), Lamarck (1816) (pars), de Blainville (1820), Lamouroux (1824); Agaricia Schweigger, 1820 (pars); Herpolitha Eschscholtz, 1825 (pars); Polyphyllia de Blainville, 1830 (pars), 1834 (pars), Quoy and Gaimard (1833); Cryptobacia Milne Edwards and Haime, 1849; Polyphyllia Veron and Pichon (1979) with additional entries.

Synonymy: Polyphyllia talpina Lamarck (1801); Fungia talpina Lamarck (1801); Fungia talpa Oken (1815), Lamarck (1816), de Blainville (1820), Lamouroux (1824); Agaricia talpa (Oken), Schweigger (1820); Herpolitha talpa (Oken), Eschscholtz (1825); Polyphyllia talpa (Oken), de Blainville (1830, 1834), Ehrenberg (1834), Dana (1846), Ortman (1888); Polyphyllia substellata de Blainville, 1830, de Blainville (1834), Milne Edwards and Haime (1851, 1860); Polyphyllia pelvis Quoy and Gaimard, 1833, Dana (1846), Milne Edwards and Haime (1851, 1860). Polyphyllia sigmoides Ehrenberg 1832, Dana (1846); Polyphyllia leptophylla Ehrenberg 1832, Dana (1846); Cryptobacia talpina (Lamarck 1801), Milne Edwards and Haime
and Pichon (1979) with additional listings of a ratio of 1:2 to 1:8 and an average 1:4 breadth to length in 50 specimens measured.

Polyphyllia talpina; Polyphyllia producta species known; forming elliptical coralla with (1925), Faustino (1927), Ma (1959), Veron (1851, 1860), Verrill (1864), Studer (1880), Quelch (1886), Duncan (1889), Bedot (1907); Cryptobacia leptophylla (Ehrenberg) Milne Edwards and Haime (1851, 1860); Polyphyllia talpina (Lamarck) Gardiner (1909), Boschma (1925), Faustino (1927), Ma (1959), Veron and Pichon (1979) with additional listings of P. talpina; Polyphyllia producta Folkeson, 1919.

TYPE SPECIES: Polyphyllia talpina (Lamarck, 1801).

Figures 3–7

CHARACTERS: A pleomorphic genus, one species known; forming elliptical coralla with a ratio of 1:2 to 1:8 and an average 1:4 breadth to length in 50 specimens measured. Usually arched in shorter diameter, this increasing with size. Smallest specimens' undersurface may be flat and these are extremely like small Herpolitha (Gardiner 1898). Specimens do not transilluminate. Upper-surface convex with the height being about half the breadth, less in small, greater in larger specimens. Uppersurface has central furrow usually running length of corallum. Usually a well-formed founder calice in center with about 14 lateral “centers” in a 10 cm specimen, proportionately more in longer ones. On either side, parallel to and about 1 cm from central furrow are rows of incomplete or partially formed growth centers. Further out there are more, less well formed and not arranged in an orderly manner. The
founder center has about 12 heavy and an equal number of light septa reaching the semblance of a columella, others in the central furrow have a radial arrangement but are less well organized; those in the periphera still less well organized until at the edge there are about 17 thin septa per cm parallel to each other. Presumably these are reshaped as growth continues. Most septa are alternately thick and thin. The thick septa have crescent-shaped lamella which are about 3–5 mm long each and 0.7 mm thick at intervals. These have jagged teeth and beaded ribs on both sides. They are very similar to those seen in Lithactinia. Between and surrounding each are the thin 0.2 mm septa which are also irregularly toothed.

The corallum is about 1.5 cm thick in mature specimens with a heavy 0.5 cm thick base. Undersurface slightly irregular, showing no costa but thickly covered with short, heavy echinulations. No well-defined growth bands, and usually no attachment scar.

The three specimens of Lithactinia novaehiberniae observed that did not show evidence of breakage and regrowth marked with *. These were oval to elliptical with 1:2.25 breadth to length ratio, basin shaped, light and usually high arched. Transillumination showed myriad perforating slits from edge to central attachment scar, which appears fresh, about 8–10 mm across, surrounded by a small elliptical area of coenosteal deposition. On the convex upper-surface directly opposite is the founder calice, sometimes two, in the horizontal central furrow which runs about half the length and ends where a sharp descent begins. Central calice has 10–12 thick septa reaching the weak trabecular columella, alternating with smaller thin septa. The central furrow is
bridged by alternating pairs of thick and thin lamellar septa meeting at an obtuse angle in the center, occasionally arranged to suggest partially formed calices. Septa can be traced from central furrow to the edge which they meet perpendicularly about 17–18 per cm.

Alternate septa thicken at regular intervals forming crescentic lamella which project slightly outward. These are about 3.5 mm long and 0.7 mm wide, jaggedly toothed and beaded on the sides. Between are thin septa, 0.2 mm wide, less conspicuous, which fuse around the ends of the lamella. Occasionally two or three thick lamella seem to join at their upper end, but nowhere are there calices other than in the central furrow. The concave
undersurface has concentric waves, probably from irregular growth (also well seen by transillumination), which measure 0.5–0.6 cm between crests. Surface has costae consisting of rows of fine beading.

The remainder of specimens do not show a central furrow. All show variations of regeneration from a small piece of corallum wall which has grown from all sides thus developing into a basin shaped structure with the original fragment more or less parallel to the substrate.

MATERIAL AND COLLECTION DATA: AEL: 1525, 1526, 1527, 1528, Solomon Is., 2 m still water; 1529 same, collected by Paul Lamberts. BBS: unnumbered specimen labelled only Polyphyllia. RMHN: * 14098, collected by Maya Wijsman-Best, 1976, outer barrier, 20–30 m, New Caledonia. MCZ: Dana’s type #553, labelled P. pileiformis; Dana’s type P. galeriformis, unnumbered. USNM: Dana’s syntype P. pileiformis #158, #980, both from “Feejee;” Dana’s syntypes P. galeriformis #155, #156, “Feejee;” * Tonga, collected in 2 m, USNM 61072; Thompson collection, American Samoa, one fragmented specimen; New Caledonia specimens 1, 2 and 3, no data. rww: Weber’s specimen #422, labelled Tonga, 1972; * 1714, New Caledonia, 20 cm, still water, 1971; #66, #67, Fiji.
opposite direction was attributable to the discriminating genera. The value of the ratio variable can be useful in discriminating genera. The analysis suggests that men of the series. The analysis suggests that men of the series. The analysis suggests that when young. One instance of overlap in the limited overlap. In two instances the overlap was due to the small size of specimens of largest and heaviest. The means of the ratios were significantly different and the calculations showed \( t = 7.11 \) for \( df = 32 \), and \( p < .001 \). Figure 16 shows the distribution of the two groups on the ratio variable. There is a limited overlap. In two instances the overlap was due to the small size of specimens of \( P. \) talpina, which are very lightly structured when young. One instance of overlap in the opposite direction was attributable to the largest and heaviest \( L. \) novaehiberniae specimen of the series. The analysis suggests that the value of the ratio variable can be useful in discriminating genera.

My collection of \( H. \) stricta Dana to 6.20 for a \( 7 \times 18 \) cm specimen of \( H. \) crassa Dana. The average weight–base area ratio was 4.07 for all. This was higher than the mean for \( P. \) talpina. In my collection of \( F. \) scutaria, a juvenile \( 4.4 \times 3.6 \) cm specimen had a ratio of 1.5 whereas the ratio in a massive \( F. \) scutaria var. oahensis was 6.73.

DISCUSSION

Reef coral species often intergrade so no clear cut distribution can always be made among various specimens in any sizable collection. The continuum of the so-called identifying features among closely allied groups can be so vexing that workers such as Wood-Jones (1907) gave up and concluded that all \( P. \) were merely growth forms of one
**TABLE 1**

**DATA ON WEIGHTS AND BASE AREA OF 44 CORAL SPECIMENS IN STUDY OF FEASIBILITY OF A STATISTICAL SEPARATION OF TWO GENERA**

<table>
<thead>
<tr>
<th>NO.</th>
<th>COLLECTION AND NO.</th>
<th>WEIGHT (g)</th>
<th>BASE AREA (cm²)</th>
<th>RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AEL 1408</td>
<td>141.5</td>
<td>49.78</td>
<td>2.84</td>
</tr>
<tr>
<td>2.</td>
<td>AEL 1563</td>
<td>200.</td>
<td>79.66</td>
<td>2.51</td>
</tr>
<tr>
<td>3.</td>
<td>AEL 1564</td>
<td>85.</td>
<td>35.</td>
<td>2.43</td>
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<td>4.</td>
<td>AEL 1565</td>
<td>136.7</td>
<td>66.27</td>
<td>2.06</td>
</tr>
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<td>5.</td>
<td>AEL 1566</td>
<td>194.5</td>
<td>72.36</td>
<td>2.69</td>
</tr>
<tr>
<td>6.</td>
<td>AEL 1567</td>
<td>145.5</td>
<td>65.42</td>
<td>2.22</td>
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<tr>
<td>7.</td>
<td>AEL 1568</td>
<td>38.</td>
<td>22.76</td>
<td>1.67</td>
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<tr>
<td>8.</td>
<td>AEL 1569</td>
<td>32.</td>
<td>20.52</td>
<td>1.56</td>
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<tr>
<td>9.</td>
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<td>734.</td>
<td>159.43</td>
<td>4.60</td>
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<tr>
<td>10.</td>
<td>USNM Str. 179</td>
<td>826.15</td>
<td>213.52</td>
<td>3.87</td>
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<td>11.</td>
<td>USNM Str. 4</td>
<td>1,219.</td>
<td>201.75</td>
<td>6.04</td>
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<td>12.</td>
<td>USNM Str. 5</td>
<td>630.</td>
<td>128.67</td>
<td>4.09</td>
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<td>13.</td>
<td>USNM Str. 6</td>
<td>839.</td>
<td>204.15</td>
<td>4.11</td>
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<td>USNM Str. 7</td>
<td>214.</td>
<td>81.03</td>
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<td>USNM Str. 8</td>
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<td>190.09</td>
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<td>116.37</td>
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<td>USNM Str. 10</td>
<td>261.</td>
<td>90.6</td>
<td>2.88</td>
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<td>168.46</td>
<td>2.73</td>
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<td>23.</td>
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<td>1,169.7</td>
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<td>25.</td>
<td>MCZ Wards</td>
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<td>26.</td>
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<td>760.</td>
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<td>27.</td>
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<td>130.2</td>
<td>66.89</td>
<td>1.95</td>
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<td>28.</td>
<td>MCZ Putnam</td>
<td>152.</td>
<td>70.25</td>
<td>2.16</td>
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</tbody>
</table>

**Polyphylla talpina**

**Lithactinia novaehiberniae**

<table>
<thead>
<tr>
<th>NO.</th>
<th>COLLECTION AND NO.</th>
<th>WEIGHT (g)</th>
<th>BASE AREA (cm²)</th>
<th>RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AEL 1525</td>
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<td>AEL 1526</td>
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<td>4.</td>
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<td>6.</td>
<td>BBM</td>
<td>120.</td>
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<td>7.</td>
<td>USNM Samoa</td>
<td>485.5</td>
<td>623.32</td>
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<td>8.</td>
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<td>111.33</td>
<td>.898</td>
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<td>9.</td>
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<td>77.6</td>
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<td>10.</td>
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<td>12.</td>
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<td>16.</td>
<td>RMNH *14098</td>
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<td>1.25</td>
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</table>

**GENUS MEAN OF RATIO**

<table>
<thead>
<tr>
<th>GENUS</th>
<th>MEAN OF RATIO</th>
<th>STANDARD DEVIATION</th>
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</thead>
<tbody>
<tr>
<td>Polyphylla</td>
<td>3.180</td>
<td>1.30</td>
</tr>
<tr>
<td>Lithactinia</td>
<td>1.114</td>
<td>.288</td>
</tr>
</tbody>
</table>

*Note: blank space = no number assigned; asterisk = specimen with no evidence of fracture and secondary growth.*
variable genus and that species designations were meaningless. It is now generally agreed that species do exist but that there are populations of corals with morphological characteristics which may overlap with other populations. Thus, one specimen can at times be designated as one of several species, depending on the bias of the observer. With a sample of sufficient size such problems become less urgent, but there usually remain some puzzling specimens that will not fit in any scheme. A taxonomist may be tempted to ignore these if he has a sufficient sample of well-defined specimens. Confusion arises where there are few examples, and he may do as Bernard (1896) did. Whenever Bernard encountered an Astreopora with a slightly different growth form he erected a new species until he had eight represented by only the holotype. These problems will remain with us until we refine our methods of identification.

Generic differences are more distinct. By definition a genus is recognized where there is a decided gap from one taxon to the next (Mayr 1969). However, the same dilemma occurs when immature specimens are encountered. Gardiner (1898) noted this when he found young specimens of Herpolitha and Polyphyllia to be extremely alike. Virtually all of the fungid corals I have examined show this tendency. Earlier museum workers were faced with defining a genus on the basis of a single specimen or a species from a published drawing. The often sketchy descriptions they gave were inadequate for later revisionists who, finding these, tended to force them into their own classification mold, seemingly almost to dispose of them. In reviewing the problem, Wijsman-Best (1972) admits that even some of the larger subdivisions such as the subfamilies Faviinae and Montastreinae are rather artificial and not recognized by all workers. But by working with large suites from as many habitats as possible, using specimens from many geographical areas and noting differences in growth patterns of the various corals, a more exact delineation may be possible.

**CONCLUSIONS**

With data obtained from various collections, combined with observations on morphological differences and with statistical analysis, Lithactinia and Polyphyllia become distinct and, in my opinion, can be recognized as separate genera. Lithactinia usually has one founder calice in a central furrow, no secondary centers, and a distinct attachment scar; Polyphyllia has many centers in a central furrow and many secondary centers, and the attachment scar is obliterated. Lithactinia has less dense coenosteum, multiple perforations and transilluminates well. Statistical analyses of the ratio between weight and base area
show that this feature alone separates Lithactinia from Polyphyllia with a probability of $p < .001$. There is no significant intergrading. Finally, the geographical range of Lithactinia, as now recognized, does not overlap that of Polyphyllia.

As with all biological collections there are exceptions to the general order, specimens which appear to be transitional between groupings. Thus, Lamarck’s no. 77, Polyphyllia talpina, has a weight-base area ratio of 1.83, and most of the characters are those of Polyphyllia. However, it is not symmetrical, shows signs of irregular growth, and has a growth scar. The place of origin is given as the Indian Ocean. Much confusion has arisen because of the lack of representative material in the past. Fortunately, Lamarck did not present a figure or a complete description of this, his only specimen.

ACKNOWLEDGMENTS

The author thanks Maya Borel-Best of the Rijksmuseum van Natuurlijke Historie and the several museum keepers who allowed me to examine their coral collections. Françoise Debrénne kindly loaned me Lamarck’s specimen no. 77. Special thanks to John Wells for his hospitality, his encouragement, and enlightening comments. Mark Cohen and Burton Lamberts, Naval Dental Research Institute, Great Lakes, Illinois, arranged and made statistical computations.

LITERATURE CITED


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