

## Some Lichens of North Eastern Langkawi and Gunung Machincang, Langkawi Islands

Shahrizim Zulkifly and Amir Feisal Merican\*

Institute of Biological Sciences, Faculty of Science, University of Malaya, 50603 Kuala Lumpur, Malaysia

\*merican@um.edu.my

**ABSTRACT** A survey of lichen diversity and distribution was carried out during expeditions in Langkawi Islands in April 2003 and 2004. A total of 387 samples were collected from Gunung Machincang and the North Eastern Part of Langkawi comprising of Sungai Sireh, Datoi, Gunung Raya, Ewa, KEDA housing area (Teluk Apau), Belanga Pecah, Lubuk Sembilang, Pulau Langgun, Sungai Kisap, Gua Cerita Area, Pulau Dendang and Teluk Mempelam. Morphological identification resulted in 36 genera of lichens, comprising of 32 microlichens (crustose), and 4 macrolichens (foliose). The common microlichens obtained were from the Family of Graphidaceae and can be found from the sea level right up to the peak of Gunung Machincang. The most common foliose lichens found were *Heterodermia sp.* and *Coccocarpia sp.* This survey represents the first record of lichens in Langkawi Islands.

**ABSTRAK** Suatu kajian kepelbagaian dan taburan liken telah dijalankan semasa ekspedisi yang dijalankan di Pulau Langkawi pada bulan April 2003 dan 2004. Sebanyak 387 sampel telah diambil dari Gunung Machincang dan bahagian Timur Laut Langkawi yang terdiri dari Sungai Sireh, Datoi, Gunung Raya, Ewa, kawasan perumahan KEDA (Teluk Apau), Belanga Pecah, Lubuk Sembilang, Pulau Langgun, Sungai Kisap, kawasan berhampiran Gua Cerita, Pulau Dendang dan Teluk Mempelam. Pengenalpastian secara morfologi telah dilakukan, di mana 36 genera liken dikenalpasti, yang merangkumi 32 mikroliken (krustos) dan 4 makroliken (folios). Mikroliken yang paling kerap dijumpai adalah dari Famili Graphidaceae dan ia boleh dijumpai dari kawasan paras laut hinggalah ke puncak Gunung Machincang. Liken jenis folios yang paling kerap dijumpai adalah *Heterodermia sp.* dan *Coccocarpia sp.* Keputusan kajian ini adalah rekod pertama liken di Pulau Langkawi.

(Langkawi Island, lichens, crustose, foliose)

### INTRODUCTION

Langkawi Islands are a combination of 104 islands, situated in the Andaman Sea off the coast of Kedah, the Northern state of Peninsular Malaysia. The formation of sedimentary rocks that made up the hills and mountains in the Langkawi Islands dates back about 500 million years to the Cambrian Era [7]. The ancient mountains and hills are a unique habitat for species of wildlife compared to the mainland. It is possible that the Langkawi Islands have species of flora and fauna quite distinct and somewhat similar to those in Thailand and the North part of Malaysia.

The first records of lichen collection in Malaysia were possibly made by Beccari [1]. Beccari made

the collections at the grounds of the government house in Sarawak. Samples of his 140 species collected were deposited in the Munich Herbarium (M) in Germany. A bibliography of Malaysian lichenology was made by Galloway [5] comprising 90 entries. Galloway [6] made an additional bibliography of Malaysian lichenology in 1997 comprising an addition of 192 entries.

We noted that there are only a small number of local collection sites already explored:

(a) Peninsular Malaysia: Penang Hill, Penang [10], Mount Brinchang, Cameron Highlands, Pahang [2], Fraser's Hill, Pahang [15] and Gunung Jerai, Kedah [3, 18].

(b) Borneo: Government House, Sarawak [1], Gunung Mulu, Sarawak [11, 12], Gunung Kinabalu, Sabah [2, 14] and Bario, Sarawak [4].

To our knowledge, there is no available report on lichen collected from the Langkawi Islands. Thus, the current expeditions serve as a starting point to collect and record the lichen diversity and distribution in the Langkawi Islands.

### STUDY AREAS

Sampling was done using a standard method of

collecting lichens [16, 17]. All samples were collected by the authors and stored at the Laboratory for Environmental Microbial Biotechnology and Biodiversity, Institute of Biological Sciences, Faculty of Science, University of Malaya. Sampling sites and other relevant information are listed in Table 1.

**Table 1.** Number of collections at each site in the Langkawi Islands

Date	Site	Locality	Number of collections	Sample Number
<b>[A] Expedition in 2003</b>				
11 April 2003	Sungai Sireh	6°21'N 99°51'E	16	001- 006
12 April 2003	Datai	6°25'N 99°41'E	33	017- 049
13 April 2003	Gunung Raya	6°22'N 99°53'E, ca. 200-893m alt.	37	050- 086
15 April 2003	Ewa	6°24'N 99°46'E, on limestone hill behind rubber plantations, ca. 40-60m. alt.	5	087- 091
	KEDA housing area (Teluk Apau)	6°21'N 99°53'E, old trail to Kampung Telok Apau, under forest canopy, ca. 40-120m alt.	18	092- 110
	Belanga Pecah	6°23'N 99°52'E ca. 18m. alt.	7	111- 117
	Lubuk Sembilang	6°22'N 99°47'E, ca. 40m. alt.	6	118-123
16 April 2003	Pulau Langgun	6°26'N 99°53'E, ca.0m alt.	38	124-161
17 April 2003	Gunung Machincang	6°23'N 99°41'E, forested area between 2 cable car stations on the mountain, ca. 550-708m and also at the foothills ca. 30-60m alt	12	162- 173
<b>Total</b>			<b>173</b>	
Date	Site	Locality	Number of collections	Sample Number
<b>[B] Expedition in 2004</b>				
5 April 2004	Gunung Machincang	6°23'N 99°29'E, ca.586, 637 alt.	149	176, 178, 179, 180 - 183, 185-189, 191, 198, 200, 202, 206, 207-209, 211-216, 218-222, 226, 227, 229 -232, 235-247, 249-251, 256-259, 261-263, 266-268, 270, 272-274,276-279, 281-282, 284-286, 288-292, 295-296, 300, 302-318, 324, 328, 330, 331, 335-337, 339, 343, 346-352, 354-356, 359, 360, 364, 365, 368 , 370-372, 374, 377-384, 386-397, 399, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000
6 April 2004	Sungai Kisap	6°23'N 99°53'E, ca.0m alt.	12	190, 193, 196, 197, 252, 253, 260, 333, 341, 367, 373, 376
6 April 2004	Gua Cerita Area	6°27'N 99°51'E, ca.1m alt.	13	192, 194, 199, 204, 234, 254, 255, 265, 269, 293, 297, 334, 369,
6 April 2004	Pulau Dendang	6°25'N 99°55'E, ca.1m alt.	6	195, 205, 264, 357, 358, 385
7 April 2004	Lubuk Sembilang	6°12'N 99°46'E, ca.79m alt.	12	174,175, 177, 217, 225, 228, 283, 325, 327, 361 -363,
7 April 2004	Teluk Mempelam, Pulau Langgun	6°23'N 99°29'E, ca.1m alt.	22	184, 201, 203, 210, 233, 248, 271, 280, 287, 294, 299, 319-322, 326, 338, 342, 344, 345, 353, 375
<b>Total</b>			<b>214</b>	

### RESULTS AND DISCUSSIONS

Table 2 lists the identified lichen genera based on the location of sampling sites. Table 3 lists the lichen genera and its distribution at various localities in the North Eastern Langkawi and Gunung Machincang, Langkawi Island. Tables 4 and 5 summarize the microlichens and macrolichens found in the North Eastern Langkawi and Gunung Machincang, respectively. Our study revealed that microlichens are more abundant than macrolichens.

Among the sites in the North Eastern Langkawi, Pulau Langgun has the largest lichen diversity (Table 3). This may indicate that the area is less polluted and suitable for the abundant growth of lichens. The island is uninhabited. Lichen has been known to be a useful indicator of pollution [9].

Gunung Machincang with an altitude of 708 m at its highest peak is a good location to collect macrolichens. Four foliose-type lichen genera, *Parmotrema* sp. (Figure 1), *Heterodermia* sp. (Figure 2), *Coccocarpia* sp. (Figure 3) and

*Leptogium* sp. (Figure 4) were identified. Foliose-type lichens were frequently observed in the mountainous regions [13]. *Coccocarpia pellita* was recorded in Lubuk Sembilang, Pulau Langgun and also Gunung Machincang. *C. pellita*

was reported in tree crowns of mossy and cloud forest and are widespread in Gunung Kinabalu [14]. No fruticose-type lichens were recorded in the present study.

**Table 2.** List of lichen genera found in various sampling sites on the North Eastern Langkawi Islands and Gunung Machinchang

No	Sampling Site	Specimen Number
<b>Gunung Raya</b>		
1	<i>Heterodermia</i> sp.	085, 086
2	<i>Byssolecania</i> sp.	053
3	<i>Laurera</i> sp.	084
4	<i>Lepraria</i>	056, 075, 076
5	<i>Ocellularia massalongoi</i> (Mont.) Hale	057
6	<i>Myriotrema</i> sp.	069
7	<i>Porina</i> sp.	060, 073, 079
8	<i>Trypethelium</i> sp.	054
<b>Pulau Langgun</b>		
1	<i>Anthracotheceium</i> sp.	161
2	<i>Clathroporina</i> sp.	201, 210
3	<i>Coccocarpia pellita</i> (Arch.) Müll.Arg. em. R. Sant	184
4	<i>Colemma</i> sp.	319, 321, 322,
5	<i>Graphis</i> sp.	147, 149, 152
6	<i>Heterodermia</i> sp.	375, 376
7	<i>Fissurina</i> sp.	138, 140, 141, 142, 155
8	<i>Lecanora</i> sp.	136, 154
9	<i>Lepraria</i> sp.	137, 342, 344, 345
10	<i>Leptogium</i> sp.	146
11	<i>Micarea</i> sp.	145
12	<i>Mycoporum</i> sp.	144
13	<i>Phyllopsora</i> sp.	153
14	<i>Pocsia</i> sp.	156
15	<i>Porina</i> sp.	124, 126, 128, 131, 157, 158, 159, 160
16	<i>Pyrenula</i> sp.	133
17	<i>Trypethelium</i> sp.	134, 135
<b>Datai</b>		
1	<i>Cryptothelium</i> sp.	030, 049
2	<i>Lecania</i> sp.	042
3	<i>Lecanora</i> sp.	021, 043
4	<i>Lepraria</i> sp.	041
5	<i>Myriotrema</i> sp.	039
6	<i>Ocellaria</i> sp.	027, 033, 034, 035
7	<i>Porina</i> sp.	020, 022, 029, 032, 044
8	<i>Rinodina</i> sp.	047
9	<i>Trypethelium</i> sp.	036, 037, 038, 048
<b>Ewa</b>		

1	<i>Porina</i> sp.	087, 088
<b>Keda (Teluk Apau)</b>		
1	<i>Buellia</i> sp.	7, 109
2	<i>Dichosporidium</i> sp.	095
3	<i>Leptogium</i> sp.	5
4	<i>Parmiella brisbanensis</i> . (C. Knight) P.M. Jørg. & D. Galloway	099, 103
5	<i>Phyllopsora</i> sp.	097
6	<i>Porina</i> sp.	093, 101
<b>Sungai Sirih</b>		
1	<i>Dichosporidium</i> sp.	007
2	<i>Lecanographa</i> sp.	012
3	<i>Monoblastia</i> sp.	003
4	<i>Mycoporum</i> sp.	010
5	<i>Ocellaria</i> sp.	005
6	<i>Porina</i> sp.	008, 011
7	<i>Rinodina</i> sp.	016
8	<i>Trypethelium</i> sp.	006
<b>Lubuk Sembilang</b>		
1	<i>Clathroporina</i> sp.	118
2	<i>Coccocarpia pellita</i> (Arch.) Müll.Arg. em. R. Sant	174, 175
3	<i>Crptothelium</i> sp.	217
4	<i>Glyphis</i> sp.	120
5	<i>Pannaria</i> sp.	121
6	<i>Pyrenula</i> sp.	119
7	<i>Leptogium</i> sp.	177, 325
<b>Sungai Kisap</b>		
1	<i>Anthracothecium</i> sp.	193
2	<i>Mycomicrothelia</i> sp.	190
3	<i>Porina</i> sp.	197
<b>Gua Cherita Area</b>		
1	<i>Mycomicrothelia</i> sp.	196
2	<i>Pyrenula</i> sp.	199
<b>Pulau Dendang</b>		
1	<i>Anthracothecium</i> sp.	205
2	<i>Porina</i> sp.	264
<b>Gunung Machincang</b>		
1	<i>Astrothelium</i> sp.	202, 206, 207, 209, 212, 213, 215,
2	<i>Clathroporina</i> sp.	203, 204,
3	<i>Coccocarpia</i> sp.	165, 174, 175, 176, 178, 179, 180, 181, 182, 183,
4	<i>Heterodermia</i> sp.	164, 166
5	<i>Lepraria</i> sp.	163, 170
6	<i>Leptogium</i> sp.	177
7	<i>Porina</i> sp.	191
8	<i>Parmotrema</i> sp.	167, 168, 169, 173
9	<i>Pertusaria</i> sp.	185, 187, 188, 189
10	<i>Pyrenula</i> sp.	200, 211,
11	<i>Sarcographina</i> sp.	162

**Table 3.** List of lichen genera and its distribution at various localities in the North Eastern Langkawi and Gunung Machinchang, Langkawi Island

Lichen	Gunung Raya	Pulau Langgun	Datai	Ewa	Keda (Teluk Apau)	Sungai Sirih	Lubuk Sembilang	Sungai Kisap	Gua Cherita area	Pulau Dendang	Gunung Machinchang
<i>Anthracotheicum sp.</i>		+						+		+	
<i>Astrothelium sp.</i>											+
<i>Buellia sp.</i>					+						
<i>Byssolecania sp.</i>	+										
<i>Clathroporina sp.</i>		+					+				+
<i>Coccocarpia sp.</i>		+					+				+
<i>Cryptothelium sp.</i>			+				+				
<i>Dichosporidium sp.</i>					+	+					
<i>Fissurina sp.</i>		+									
<i>Glyphis sp.</i>							+				
<i>Graphis sp.</i>		+									
<i>Heterodermia sp.</i>	+	+									+
<i>Laurera sp.</i>	+										
<i>Lecania sp.</i>			+								
<i>Lecanographa sp.</i>						+					
<i>Lecanora sp.</i>		+	+								
<i>Lepraria sp.</i>	+	+	+								+
<i>Leptogium sp.</i>		+			+		+				+
<i>Micarea sp.</i>		+									
<i>Mycomicrothelia sp.</i>								+	+		
<i>Monoblastia sp.</i>						+					
<i>Mycoporium sp.</i>		+				+					
<i>Myriotrema sp.</i>	+		+								
<i>Ocellaria sp.</i>			+			+					
<i>Ocellularia sp.</i>	+										
<i>Pannaria sp.</i>							+				
<i>Parmiella sp.</i>					+						
<i>Parmotrema sp.</i>											+
<i>Pertusaria sp.</i>											+
<i>Phyllopsora sp.</i>		+			+						
<i>Pocsia sp.</i>		+									
<i>Porina sp.</i>	+	+	+	+	+	+		+		+	+
<i>Pyrenula sp.</i>		+					+		+		+
<i>Rinodina sp.</i>			+			+					
<i>Sarcographina sp.</i>											+
<i>Trypethelium sp.</i>	+	+	+			+					

**Table 4.** List of Microlichens (Crustose) found in the North Eastern Langkawi and Gunung Machincang, Langkawi Island

	Genus	Family
1.	<i>Anthracothecium</i>	Pyrenulaceae
2.	<i>Astrothelium</i>	Trypetheliaceae
3.	<i>Buellia</i>	Physciaceae
4.	<i>Byssolecania</i>	Lecanorales: Pilocarpaceae
5.	<i>Clathroporina</i>	Trichotheliaceae
6.	<i>Cryptothelium</i>	Trypetheliaceae
7.	<i>Dichosporidium</i>	Roccellaceae
8.	<i>Fissurina</i>	Graphidaceae
9.	<i>Glyphis</i>	Graphidaceae
10.	<i>Graphis</i>	Graphidaceae
11.	<i>Laurera</i>	Trypetheliaceae
12.	<i>Lecania</i>	Bacidiaceae
13.	<i>Lecanographa</i>	Roccellaceae
14.	<i>Lecanora</i>	Lecanoraceae
15.	<i>Lepraria</i>	Leprariaceae
16.	<i>Micarea</i>	Micareaceae
17.	<i>Mycomicrothelia</i>	Arthopyreniaceae
18.	<i>Monoblastia</i>	Monoblastiaceae
19.	<i>Mycoporum</i>	Mycoporaceae
20.	<i>Myriotrema</i>	Thelotremataceae
21.	<i>Ocellaria</i>	Thelotremataceae
22.	<i>Ocellularia</i>	Thelotremataceae
23.	<i>Pannaria</i>	Pannariaceae
24.	<i>Parmiella</i>	Pannariaceae
25.	<i>Pertusaria</i>	Pertusariaceae
26.	<i>Phyllopsora</i>	Bacidiaceae
27.	<i>Pocsia</i>	Verrucariales
28.	<i>Porina</i>	Trichotheliaceae
29.	<i>Pyrenula</i>	Pyrenulaceae
30.	<i>Rinodina</i>	Physciaceae
31.	<i>Sarcographina</i>	Graphidaceae
32.	<i>Trypethelium</i>	Trypetheliaceae

**Table 5.** List of Macrolichens (Foliose) found in the North Eastern Langkawi and Gunung Machincang, Langkawi Island

	Genus	Family
1.	<i>Coccocarpia</i>	Coccocarpiaceae
2.	<i>Heterodermia</i>	Physciaceae
3.	<i>Leptogium</i>	Collembataceae
4.	<i>Parmotrema</i>	Parmeliaceae



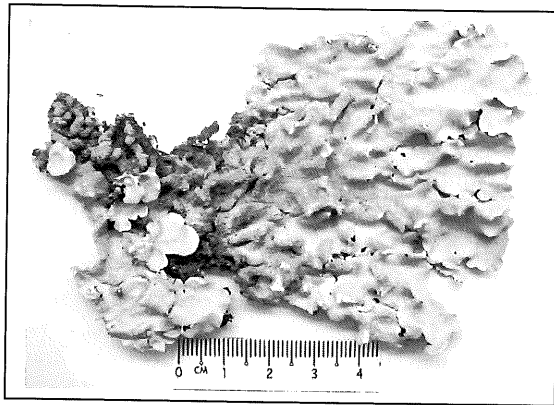


Figure 1. *Parmotrema* sp.

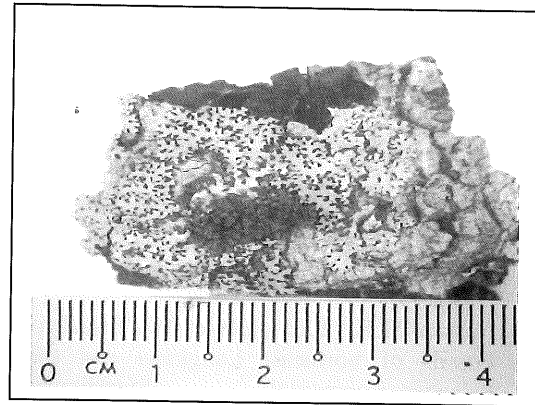


Figure 2. *Heterodermia* sp.

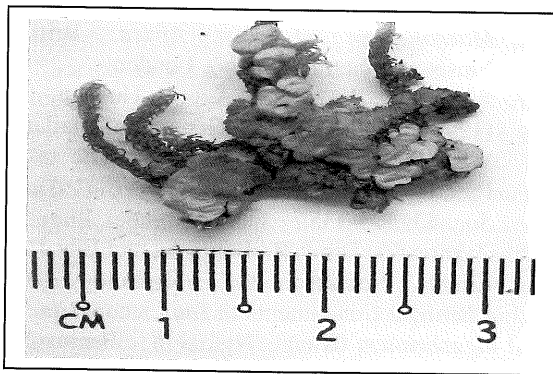


Figure 3. *Coccocarpia pellita*

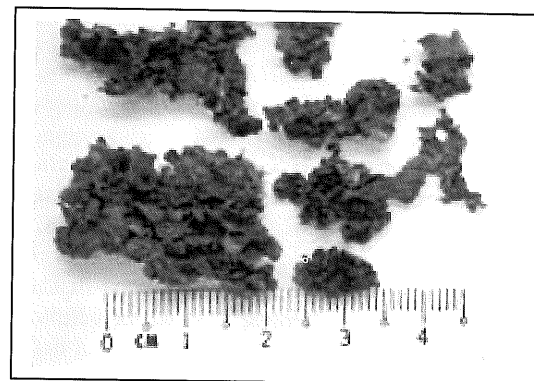


Figure 4. *Leptogium* sp.

This study serves as a diversity survey of the flora of lichens in the Langkawi Island and also useful in the search for unique bioactive compounds found only in lichens. Lichens have been shown to contain bioactive compounds of commercial value [8]. Chemical characterization of the lichen compounds from the collected lichens is underway in our laboratory.

### CONCLUSION

A total of 387 lichen collections were made in the Langkawi Islands with 32 genera of microlichens (crustose) and 4 genera of macrolichens (foliose) identified.

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