

I invite those with better numbers than I have to join the fray. My knowledge of the Oriental and Asian Palearctic regions is exceedingly limited. The final figure is not yet in.

True Butterflies

In the beginning there was Seitz. Over a period of some 20 years (1907-1927), A. Seitz and his collaborators described the world's Rhopaloceran fauna. No one has equalled this feat. I counted the number of species in Seitz, not including forms (Table 1). The numbers are too low for most groups, but the estimate of 10,200 species is the first real approximation.

The only serious latter day enumerators of whom I am aware are Ehrlich & Raven (1965, Table 1). They did not divulge the sources of their information. Their estimate of 12,000 to 15,000 true butterflies falls neatly between the "more than 10,000 species" and "20,000 species including skippers" quoted in various books (e.g. Fox & Fox 1964, Lewis 1973). I used only post-1965 sources for my tabulation, so the similarities between my estimates and those of Ehrlich and Raven are likely to reflect reality.

Table 1. Number of true butterflies from Seitz (1907-1927) (exclusive of additions or supplements) and from Ehrlich & Raven* (1965) (last row).

REGION	PAPIL.	PIERI.	NYMPH.	LYCAE.	TRUE BUTTER.
PALEAR.	71	148	532	307	1,058
INDO-AU.	214	277	1,218	994	2,703
AFRICAN	80	175	832	824	1,911
AMERICAN	172	348	2,328	1,683	4,531
WORLD	537	948	4,910	3,808	10,203
WORLD*	575-700	950-1,150	4,800-6,200	5,800-7,200	12,000-15,000

Table 2. Numbers of butterflies in the Malay Peninsula (from Eliot 1978) and in Panama (from Robbins & Small 1981, see text).

	PAPIL.	PIERI.	NYMPH.	LYCAE.	TRUE BUTTER.	HESPE.	ALL BUTTER.
MALAY PENIN.	44	45	273	400	762	246	1,008
PANAMA	29	65	427	530	1,051	500	1,550

Table 3. Number of butterflies in the World. See text for sources.

REGION	PAPIL.	PIERI.	NYMPH.	LYCAE.	TRUE BUTTER.	HESPE.	ALL BUTTER.
PALEAR.	93	161	722	392	1,368		
AUSTR.	74	174	323	446	1,017	{ 750-	{ 5,585-
ORIENT.	141-	145-	878-	1,286-	2,450-	900	6,135
	165	168	1,021	1,496	2,850		
AFRICAN	87	146	1,103	1,380	2,716	{ 423-508	{ 3,150-3,225
NEARC.	35	63	202	171	471		
ANTILLES	22	50	97	32	201	{ 1,838-	{ 7,175-
NEOTROP.	169	347	1,850-	2,300-	4,675-	2,206	8,860
			2,500	3,000	6,000		
WORLD	621-645	1,086-1,105	5,175-5,975	6,000-6,900	12,900-14,600	3,000-3,600	15,900-18,225

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HOW MANY BUTTERFLY SPECIES?

How many species of butterflies exist? To which question one might respond: "Does it really matter? Isn't it a meaningless number?" True, but . . . (1) it is one of those numbers any jack-of-the-trade lepidopterist worth his salt should have handy. (2) More than 20 years ago, Yale ecologist G. E. Hutchinson asked the very good question, "Why are there so many animal species?". But we do not even know the preliminary "How many species exist?" And supposedly butterflies are the best-known group of invertebrates. (3) It is difficult to talk about conservation on a global scale if we do not know how many species exist to conserve. (4) It is good sport. Any number can play: splitters to one side, lumpers to the other. By the turn of the century we should have some good answers.

The solution below treats the true butterflies and the skippers. I divide the true butterflies into four major groups: the papilionids, the pierids, the nymphalids (including danaids, satyrids, libytheids, etc.), and the lycaenids (including riordinids, liptenids, curetids, etc.). The hesperiids are treated as one group including megathymids.

I record numbers of species for the Australian (D'Abbrera 1977, but see Miller & Miller 1981), Afrotropical (D'Abbrera 1980), Palearctic (Kostrowicki 1969), Nearctic (Miller & Brown 1981), and Antillean (Riley 1975) regions (Table 3). These numbers vary in accuracy but probably represent reasonable approximations of species-richness for their respective areas. The only reliable and complete lists of species numbers in the Oriental region and the continental Neotropics are for the Malay Peninsula (Eliot 1978, Table 2) and for Panama between the Costa Rican border and the eastern edge of Panama Province (Robbins and Small, 1981; the brassolids and hesperiids are omitted from that work, but are included in Table 2). These lists are valuable indicators of the proportional representation of each group in their respective regions.

My estimates for the Neotropics are given in Table 3. The numbers for the Papilionidae and Pieridae come from D'Abbrera (1981). The estimate of 2650±350 lycaenids comes from my work and from informal discussions with Curtis Callaghan (an expert in the Riordinidae); the lycaenids are

about evenly divided between "hairstreaks" and "metalmarks" with a handful of "blues" and one "copper". In Panama, for every nymphalid species there are 1.24 lycaenid species, 0.15 pierid species, and 0.07 papilionid species. Assuming these proportions are constant throughout the neotropics, then I get an estimate of 2175±325 Neotropical nymphalids.

I estimated the total number of Oriental species the following way. There are 1.42 more African species than in Seitz, 1.35 more New World species, and 1.29 more Palearctic species. I multiplied the 2,700 Indo-Australian species in Seitz by these factors, subtracted the Australian species, and averaged the results. I then assigned these species to each "family" according to the proportional representation in the Malay Peninsula. Perhaps someone familiar with the Oriental fauna will let me know how badly these estimates distort reality.

Skippers

Evans (1937-1955) treated the world hesperiid fauna. His numbers are too low because he only used specimens in the British Museum, because he tended to "lump" when in doubt, and because many new species have been described in the last three decades. I record a range of species numbers (Table 3): the smaller numbers are Evans' figures and the larger ones 20% higher.

Conclusions

1. There exist 12,900-14,600 true butterfly species and 15,900-18,225 butterflies including skippers. Reasonable single figure estimates might be 14,000 and 17,500, respectively. The figures for the true butterflies agree surprisingly well with those of Ehrlich & Raven.

2. There are more lycaenids than nymphalids. Nymphalids have classically been considered the richest group, but Erlich and Raven suggested that lycaenids might be richer. Lycaenids predominate in tropical areas (more than 50% of true butterflies in Africa, the Malay Peninsula, and Panama; 44% in the Australian region), while the nymphalids predominate in the relatively depauperate regions (about 50% of the Holarctic and Antillean regions). Unless the figures for Panama and the Malay Peninsula are grossly unrepresentative, then there are more lycaenids.

3. The richest area for butterflies is the Neotropics. There are 1.4 times as many true butterflies in Panama as in the Malay Peninsula and about twice as many skippers. (Panama is approximately half the size of the Malay Peninsula.) The Neotropical fauna is more than twice as rich as the African fauna. Nearly half (43-50%) of the world's butterfly species, including skippers, occur in the New World.

(I thank John Burns for critically reading the manuscript. A list of references is available from the author: Robert K. Robbins, Dept. of Entomology, NHB 127, Smithsonian Institution, Washington, D.C. 20560)

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