On the diversity of butterfly communities

"Comparing the diversity of butterfly communities in two areas"

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Author used two methods to quantify diversity of butterfly communities in two areas for compering the abundance diversity of butterfly communities.

1 There are two methods for quantifying diversity. Both methods indicate complexity using two variables.

They are measured diversity using the number of species and its number of individuala of each species.

① Shannon Weaver Imformation Measure

$Hs = -\Sigma pi \log pi$

② Simpson index diversity

$\lambda = \Sigma ni(ni-1)/N(N-1)$

$\beta = 1/\lambda$ β ：diversity index

2 Butterfly abundance and its comparative value

Shannon Weaver Imformation Measure

Butterfly abundance and diversity are calculated from the number of butterfly species and its individual numbers in two areas.

＊The number of observed species and its individuals are assumed values.

(In reality, these two variables, the number of species and its individual number, are observed and measured)

A area

Species	no. i	Ind.Nov. ni	pi	log pi	pi logpi
Pseudozizeeria maha	1	15	0.4285	-0.3676	-0.1575
Eurema mandarina	2	8	0.2286	-0.6402	-0.1463
Pieris napae	3	5	0.1429	-0.8451	-0.1208
Papilio xuthus	4	3	0.0857	-1.0671	-0.0914
Papilio dehaanii	5	1	0.0286	-1.5436	-0.0441
Graphium Sarpedon	6	1	0.0286	-1.5436	-0.0441
Papilio Memnon	7	1	0.0286	-1.5436	-0.0441
Pieris melete	8	1	0.0286	-1.5436	-0.0441
		N 35	1.oooo	Σpi log pi=-0.6924	

Hs＝-Σpi log pi＝-（-0.6924）＝0.6924

B area

Species	no. i	Ind.Nov. ni	pi	log pi	pi logpi
Pseudozizeeria maha	1	20	0.4348	-0.3617	-0.1537
Pieris napae	2	15	0.3261	-0.6402	-0.1587
Colioas erate	3	3	0.0652	-1.1858	-0.0773
Papilio xuthus	4	5	0.1087	-1.9638	-0.1048
Graphium Sarpedon	5	1	0.0217	-1.6635	-0.0361
Neptis sappho	6	1	0.0217	-1.6635	-0.0361
Eurema mandarin	7	1	0.0217	-1.6635	-0.0361
			1.oooo	Σpi log pi=-0.6028	

Hs＝-Σpi log pi＝-（-0.6028）＝0.6028

A area Hs＝0.6924

B area Hs＝0.6028

A〉B

The butterfly information index and diversity at A area 15% higher than those at B area.

3 Butterfly abundance and its comparative value

"Simpson index diversity"

Diversity is compared using the observed number of species and individuals mentioned above.

$\lambda = \Sigma ni(ni-1)/N(N-1)$

$\beta = 1/\lambda$　β:Simpson index diversity

A area

λ={15(15-1)+8(8-1)+5(5-1)+3(3-1)+1(1-1)+1(1-1)+1(1-1)+1(1-1)}/35(35-1)

2010+56+20+6+0+0+0+0/2070=0.2454

$\beta = 1/\lambda = 1/0.2454 = 4.075$

B area

λ={20(20-1)+15(15-1)+3(3-1)+5(5-1)+1(1-1)+1(1-1)+1(1-1) }/46(46-1)

(380+210+6+20+0+0+0)/2070=0.2976

$\beta = 1/\lambda = 1/0.2976 = 3.360$

A〉B

The butterfly information index and diversity at A area is 21% higher than at B area.

This formula is simple to calculate, but if the number of individuals of a species is 1, then "ni(ni-1)=0" and this is not reflected in the overall result.

The Shannon Weaver information measure (index) is an appropriate way for quantity butterfly diversity.

4 Observation values and data collection method

① Butterfly-rich periods; May and September

② Deciding two areas for comparing

③ Fixed point observations for five days each month, from 10:00 to 11:00.

④ Cumulative number of species and individuals in May
Cumulative number of species and individuals in September

Analysis results Shannon Weaver information index (numbers are provisional)

	May	Sept.
A area	0.6924	0.5234
B area	0.6028	0.7253

In May, A area is more diverse and rich than in September.

In May, A area diverse and rich. In September, B area is more diverse and rich.

end