

Answers to Exercise 22

Niche Breadth and Resource Partitioning

- Species 1 consumed 4 prey types, while species 2 consumed 5 prey types. The Levins measure of niche breadth, B , suggests that species 2 has a broader dietary niche than species 1. The standardized niche breadth, B_A , suggests that species 2 has almost twice the niche breadth as species 1. The amount of overlap (O) between the two species is 0.28. This measure ranges between 0 (no overlap) and 1 (complete overlap), so 0.28 suggests weak overlap in diets. The MacArthur-Levins overlap measure, M , suggests that the extent to which species 1 is overlapped by species 2 (0.223) is less than the extent to which species 2 is overlapped by species 1.

	A	B	C	D	E	F	G
18	$n =$	4				$n =$	5
19	$B =$	1.533313				$B =$	2.491417
20	$B_A =$	0.177771				$B_A =$	0.372854
21	$M_{12} =$	0.22284				$M_{21} =$	0.362084
22	$O =$	0.284055				$O =$	0.284055

- Keep in mind that there are several assumptions, as well as several sources of error, that can creep into many ecological analyses. Some points to consider in niche analysis include whether diet choices are a function of the availability of food resources. For example, plentiful food items may be consumed more readily than rare items simply because of their current levels of abundance, which can change over time.
- To maximize the niche breadth, species 1 should consume 100 items from each of the 10 prey species. To minimize the niche breadth, species 1 should consume only one prey type.
- To minimize overlap (O) between the two species, species 1 should consume 365 food items of any of the prey type not consumed by species 2. Our Solver results are shown on the next page.

	A	B	C	D	E	F	G	H	I	J
4		Species 1				Species 2				
5	Resource	# users	# ²	<i>p</i>	<i>p</i> ²	# users	# ²	<i>p</i>	<i>p</i> ²	<i>p</i> ₁ * <i>p</i> ₂
6	1	365	133225	1	1	0	0	0	0	0
7	2	0	0	0	0	0	0	0	0	0
8	3	0	0	0	0	38	1444	0.160338	0.025708	0
9	4	0	0	0	0	24	576	0.101266	0.010255	0
10	5	0	0	0	0	30	900	0.126582	0.016023	0
11	6	0	0	0	0	140	19600	0.590717	0.348947	0
12	7	0	0	0	0	5	25	0.021097	0.000445	0
13	8	1.00E-07	1E-14	2.74E-10	7.51E-20	0	0	0	0	0
14	9	0	0	0	0	0	0	0	0	0
15	10	0	0	0	0	0	0	0	0	0
16	Y =	365	133225	1	1	237	22545	1	0.401378	0
17										
18	<i>n</i> =	2				<i>n</i> =	5			
19	<i>B</i> =	1				<i>B</i> =	2.491417			
20	<i>B</i> _A =	5.48E-10				<i>B</i> _A =	0.372854			
21	<i>M</i> ₁₂ =	0				<i>M</i> ₂₁ =	0			
22	<i>O</i> =	0				<i>O</i> =	0			

5. N/A