

TO BE USED WITH THE SEQUENTIAL COMPARISON INDEX OF CAIRNS et al. (1968)
FOR ASSESSING THE DIVERSITY OF BENTHIC MACROINVERTEBRATES IN LOTIC SYSTEMS

DEVELOPED BY RYAN STITT AND DAVID LEGG
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USA

ORGANISM NUMBER	LOWER STOP VALUE	CUMULATIVE RUNS	UPPER STOP VALUE	ORGANISM NUMBER	LOWER STOP VALUE	CUMULATIVE RUNS	UPPER STOP VALUE
1	-		-	44	27.9		41.3
2	-		-	45	28.6		42.2
3	-		-	46	29.4		43.0
4	-		-	47	30.1		43.9
5	-		-	48	30.8		44.8
6	-		-	49	31.5		45.6
7	-		-	50	32.2		46.5
8	-		-	51	33.0		47.4
9	-		-	52	33.7		48.2
10	4.5		10.9	53	34.4		49.1
11	5.2		11.9	54	35.1		50.0
12	5.8		12.8	55	35.9		50.8
13	6.4		13.7	56	36.6		51.7
14	7.1		14.6	57	37.3		52.6
15	7.7		15.6	58	38.0		53.4
16	8.4		16.5	59	38.8		54.3
17	9.1		17.4	60	39.5		55.1
18	9.7		18.3	61	40.2		56.0
19	10.4		19.2	62	41.0		56.9
20	11.1		20.1	63	41.7		57.7
21	11.8		21.0	64	42.4		58.6
22	12.4		21.9	65	43.1		59.4
23	13.1		22.8	66	43.9		60.3
24	13.8		23.7	67	44.6		61.1
25	14.5		24.6	68	45.3		62.0
26	15.2		25.5	69	46.1		62.9
27	15.9		26.4	70	46.8		63.7
28	16.6		27.3	71	47.5		64.6
29	17.3		28.2	72	48.3		65.4
30	18.0		29.0	73	49.0		66.3
31	18.7		29.9	74	49.8		67.1
32	19.4		30.8	75	50.5		68.0
33	20.1		31.7	76	51.2		68.8
34	20.8		32.6	77	52.0		69.7
35	21.5		33.4	78	52.7		70.5
36	22.2		34.3	79	53.4		71.4
37	22.9		35.2	80	54.2		72.2
38	23.6		36.1	81	54.9		73.1
39	24.3		37.0	82	55.7		73.9
40	25.1		37.8	83	56.4		74.8
41	25.8		38.7	84	57.1		75.6
42	26.5		39.6	85	57.9		76.5
43	27.2		40.4	86	58.6		77.3

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87	59.4		78.2	132	93.0		116.2
88	60.1		79.0	133	93.7		117.0
89	60.8		79.9	134	94.5		117.9
90	61.6		80.7	135	95.2		118.7
91	62.3		81.6	136	96.0		119.5
92	63.1		82.4	137	96.7		120.4
93	63.8		83.3	138	97.5		121.2
94	64.6		84.1	139	98.3		122.1
95	65.3		85.0	140	99.0		122.9
96	66.0		85.8	141	99.8		123.7
97	66.8		86.7	142	100.5		124.6
98	67.5		87.5	143	101.3		125.4
99	68.3		88.4	144	102.0		126.3
100	69.0		89.2	145	102.8		127.1
101	69.8		90.1	146	103.5		127.9
102	70.5		90.9	147	104.3		128.8
103	71.3		91.7	148	105.0		129.6
104	72.0		92.6	149	105.8		130.4
105	72.7		93.4	150	106.6		131.3
106	73.5		94.3	151	107.3		132.1
107	74.2		95.1	152	108.1		133.0
108	75.0		96.0	153	108.8		133.8
109	75.7		96.8	154	109.6		134.6
110	76.5		97.7	155	110.3		135.5
111	77.2		98.5	156	111.1		136.3
112	78.0		99.3	157	111.8		137.1
113	78.7		100.2	158	112.6		138.0
114	79.5		101.0	159	113.4		138.8
115	80.2		101.9	160	114.1		139.7
116	81.0		102.7	161	114.9		140.5
117	81.7		103.6	162	115.6		141.3
118	82.5		104.4	163	116.4		142.2
119	83.2		105.2	164	117.1		143.0
120	84.0		106.1	165	117.9		143.8
121	84.7		106.9	166	118.7		144.7
122	85.5		107.8	167	119.4		145.5
123	86.2		108.6	168	120.2		146.3
124	87.0		109.5	169	120.9		147.2
125	87.7		110.3	170	121.7		148.0
126	88.5		111.1	171	122.4		148.8
127	89.2		112.0	172	123.2		149.7
128	90.0		112.8	173	124.0		150.5
129	90.7		113.7	174	124.7		151.4
130	91.5		114.5	175	125.5		152.2
131	92.2		115.3	176	126.2		153.0

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177	127.0		153.9	189	136.1		163.9
178	127.8		154.7	190	136.9		164.7
179	128.5		155.5	191	137.6		165.5
180	129.3		156.4	192	138.4		166.4
181	130.0		157.2	193	139.1		167.2
182	130.8		158.0	194	139.9		168.0
183	131.5		158.9	195	140.7		168.9
184	132.3		159.7	196	141.4		169.7
185	133.1		160.5	197	142.2		170.5
186	133.8		161.4	198	142.9		171.4
187	134.6		162.2	199	143.7		172.2
188	135.3		163.0	200	144.5		173.0

How to use this Plan:

- 1) A sample of benthic macroinvertebrates from which the silt, sticks, leaves, aquatic vegetation, stones, and sand have been removed must be available.
- 2) The sampled organisms are placed in an enamel or plastic sorting tray containing ethanol. We use plastic trays that are 26 cm wide, 34.5 cm long, and 4.5 cm deep. On the inside of the trays, we create a grid (1 × 1 cm) using a 'grease pencil'. Our trays have grids of 20 columns and 12 rows; columns are numbered from 1 through 20 and rows are numbered from 1 through 12.
- 3) Sampled organisms are placed into a tray and arranged so one organism occupies each cell. If more organisms exist than there are cells, then two are placed in some cells.
- 4) A single cell is then selected using a random coordinate system. This is done by randomly selecting a row number, then randomly selecting a column number; the organism occupying that cell is then examined. If two organisms occupy that cell, then one is randomly selected for examination.
- 5) The number '1' is written in the space beneath the 'CUMULATIVE RUNS' column of the sequential sampling table for organism number 1; this represents the first 'run'.

- 6) A second cell is then randomly selected, with the organism occupying that cell being examined and compared with the organism that occupied the first; comparisons are made based on color, body form, and obvious morphological characters such as the presence, location, and number of gills. Technicians are instructed to consider any two organisms that have the same morphological characters, but differ in size, to be the same.
- 7) If the second organism is identical to the first, then the number '1' is written in the space beneath the 'CUMULATIVE RUNS' column for organism number 2; this represents the continuation of the first run. If the second organism is not identical to the first, the number '2' is written in the space beneath the 'CUMULATIVE RUNS' column for organism number 2; this represents the beginning of the second run. Once selected, organisms are not returned to the tray.
- 8) This process of comparing the 'present' organism to that which was previously selected (e.g., comparing organism #3 with organism #2, and organism #4 with organism #3, etc.) continues until at least 10 organisms have been examined. For the 10th organism, if the cumulative number of runs is less than or equal to 4.5, which is the 'LOWER STOP VALUE', the technician may stop examining organisms and declare the diversity of that sample as being less than the threshold of 0.8 with 95% certainty ('LOW' classification). If it is not less than or equal to 4.5, the cumulative number of runs is compared with the 'UPPER STOP VALUE', which is 10.9. If the cumulative number of runs is greater than or equal to the upper stop value, the technician may stop examining organisms and declare the diversity of that sample as being greater than the threshold of 0.8 with 95% certainty ('HIGH' classification). If the cumulative number of runs is between the values of 4.5 and 10.9, then additional organisms must be examined.
- 9) Organisms continue to be randomly selected and compared, with the cumulative number of runs being updated and compared with the lower and upper stop values until either a 'LOW' or 'HIGH' classification is made or until 200 organisms are examined. If neither 'LOW' nor 'HIGH' classifications are made after the 200th organism, classification is not possible because the level of diversity is very near the threshold value of 0.8.

Reference Cited

Cairns, J. Jr., D. W. Albaugh, F. Busey and M. D. Chanay. 1968. The sequential comparison index-a simplified method for non-biologists to estimate relative differences in biological diversity in stream pollution studies. *Journal of the Water Pollution Control Federation* 40: 1607-1613.