

Supporting Information

Spatially-explicit network analysis reveals multi-species annual-cycle movement patterns of sea ducks

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Ecological Applications

Appendix S2

Table S1. Change in normalized centrality and connectivity values using alternative weighting systems relative to species-weighted¹ values.

	Individual Only ²				Individual & Species ³				Duration ⁴				
	Indegree	Outdegree	Betweenness	dPC	Indegree	Outdegree	Betweenness	dPC	Indegree	Outdegree	Betweenness	dPC	
Overall mean	-0.02	-0.02	-0.01	-0.01	-0.04	0.02	0.02	-0.02	-0.02	-0.06	-0.01	0.02	
Node	1	0.00	0.03	-0.09	-0.11	0.00	0.07	0.35	0.11	0.00	-0.23	-0.30	0.00
	2	-0.04	-0.03	0.02	-0.10	-0.06	0.07	0.01	-0.02	0.07	-0.14	-0.02	0.12
	3	-0.09	-0.07	0.00	0.01	-0.08	-0.02	0.00	-0.04	0.15	-0.06	0.00	0.10
	4	-0.06	-0.04	0.00	0.00	-0.01	0.01	0.00	0.00	0.05	-0.01	0.00	0.00
	5	0.09	0.04	-0.02	-0.09	-0.04	0.05	-0.01	0.03	-0.07	-0.10	0.02	-0.13
	6	0.02	0.04	0.00	-0.06	-0.01	0.05	0.00	0.03	-0.01	-0.07	0.01	-0.07
	7	-0.02	-0.02	0.03	0.16	-0.12	-0.04	-0.07	-0.19	0.20	-0.15	0.04	0.40
	8	-0.05	-0.02	0.00	0.00	-0.03	-0.02	0.00	-0.01	0.09	-0.03	0.00	0.01
	9	0.01	0.02	-0.06	-0.02	-0.03	0.03	0.02	0.00	0.01	-0.14	0.10	0.00
	10	-0.02	0.00	-0.01	-0.02	-0.01	0.02	0.00	0.00	0.00	-0.08	0.01	-0.01
	11	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	-0.03	0.00	0.00
	12	-0.04	-0.07	-0.08	0.04	-0.14	-0.01	0.01	-0.15	-0.24	-0.13	-0.02	-0.12
	13	0.02	0.02	0.00	-0.01	-0.01	0.02	0.00	0.00	-0.03	-0.04	0.00	-0.01
	14	-0.17	-0.16	-0.12	-0.09	-0.06	0.16	0.27	0.17	0.07	-0.11	0.01	-0.03
	15	-0.01	-0.03	0.07	0.00	-0.09	-0.01	-0.03	-0.04	-0.15	-0.05	-0.04	-0.04
	16	-0.07	0.00	0.00	0.17	-0.14	0.00	-0.15	-0.38	-0.05	0.00	0.15	0.35
	17	-0.01	0.00	0.01	0.01	-0.05	-0.02	-0.01	-0.03	0.04	-0.03	0.00	0.02
	18	0.00	-0.03	0.01	-0.01	-0.05	0.02	0.03	-0.01	-0.13	-0.05	0.07	-0.04
	19	-0.03	-0.04	-0.03	0.00	-0.06	0.00	0.00	-0.02	-0.06	0.00	-0.02	0.00
	20	-0.04	-0.03	-0.01	0.01	-0.05	-0.01	0.00	-0.02	-0.04	0.02	0.11	0.00
	21	-0.02	-0.02	0.00	-0.01	-0.02	0.01	0.00	0.00	-0.02	-0.06	0.00	0.00
	22	-0.01	-0.01	0.01	0.00	-0.04	-0.01	0.01	0.00	-0.03	-0.02	-0.02	0.00
	23	-0.06	-0.06	0.10	-0.02	-0.06	0.02	-0.07	-0.02	-0.05	-0.04	-0.18	0.00
	24	0.00	-0.01	0.00	0.00	-0.01	0.01	0.00	0.00	-0.03	-0.03	-0.01	0.00
	25	0.00	0.00	-0.01	-0.01	-0.01	0.01	0.00	0.00	-0.02	-0.04	-0.01	0.00
	26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.04	0.00	0.00	0.00
	27	0.05	0.01	-0.04	-0.02	-0.03	0.02	0.02	0.00	-0.12	-0.03	-0.10	-0.02
	28	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.02	0.01	0.00	0.00
	29	-0.09	-0.06	-0.07	-0.02	-0.04	0.01	0.03	0.00	-0.04	-0.02	-0.07	-0.01
	30	-0.03	-0.02	0.00	0.00	-0.03	0.01	0.05	0.00	-0.06	-0.04	-0.06	-0.01
	31	-0.06	-0.09	0.00	0.00	-0.03	0.03	0.01	-0.02	-0.09	-0.12	-0.01	-0.02

¹Species-weighted: for centroid x in species i , $weight_x = (N \text{ centroids}_{total}) \times (N \text{ centroids}_i)^{-1}$

²Individual-only: for centroid x in individual j , $weight_x = (N \text{ centroids}_j)^{-1}$

³Individual & species: for centroid x , individual j , and species i , $weight_x = (N \text{ centroids}_j)^{-1} \times (N \text{ individuals}_i)^{-1}$

⁴Duration: for centroid x , $weight_x = (\text{days at centroid location}) \times 365^{-1}$

Table S2. Centrality values for global network with and without *dresseri* common eider.

	With <i>S. m. dresseri</i>			Without <i>S. m. dresseri</i>			Difference in normalized scores		
	Indegree	Outdegree	Betweenness	Indegree	Outdegree	Betweenness	Indegree	Outdegree	Betweenness
Overall mean	31.75	31.82	17.90	30.15	30.14	18.16	0.00	-0.01	-0.02
Node									
1	73.72	71.55	49.87	65.77	66.63	50.91	-0.09	-0.05	0.00
2	60.15	61.34	32.98	52.15	52.15	28.72	-0.10	-0.10	-0.06
3	37.42	32.86	7.96	37.42	32.86	8.51	0.01	0.00	0.00
4	17.32	12.41	0.84	17.32	12.41	1.00	0.00	0.00	0.00
5	41.67	40.82	12.64	28.62	28.20	12.30	-0.18	-0.14	-0.01
6	20.49	26.61	5.22	15.30	16.97	4.67	-0.07	-0.11	-0.01
7	38.50	43.15	10.66	38.50	43.15	11.35	0.01	0.01	0.01
8	18.97	17.44	2.41	18.97	17.44	2.57	0.01	0.00	0.00
9	24.60	31.70	15.80	24.60	31.70	15.79	0.01	0.00	0.00
10	16.97	23.87	9.77	16.97	23.87	9.81	0.00	0.00	0.00
11	4.00	3.87	0.08	4.00	3.87	0.08	0.00	0.00	0.00
12	65.45	73.36	38.58	63.61	71.13	41.25	-0.01	-0.02	0.02
13	17.23	17.55	3.70	11.31	11.22	3.40	-0.08	-0.07	0.00
14	60.24	61.65	50.90	60.24	61.65	51.27	0.02	0.01	-0.01
15	40.47	43.89	19.34	38.52	40.82	20.73	-0.02	-0.03	0.01
16	73.86	88.18	80.98	72.21	87.18	82.97	0.00	0.00	0.00
17	21.84	21.91	3.58	18.11	19.21	2.99	-0.05	-0.03	-0.01
18	38.57	29.39	15.50	38.57	29.39	15.59	0.01	0.00	0.00
19	36.61	28.28	39.81	36.61	28.28	40.46	0.01	0.00	0.00
20	26.53	25.46	11.99	26.53	25.46	13.58	0.01	0.00	0.02
21	25.40	17.75	3.68	25.40	17.75	3.68	0.01	0.00	0.00
22	15.49	17.66	8.74	15.49	17.66	8.88	0.00	0.00	0.00
23	47.33	45.60	65.05	47.33	45.60	65.76	0.02	0.01	-0.01
24	17.23	10.95	7.00	17.23	10.95	7.12	0.00	0.00	0.00
25	14.97	12.33	4.55	14.97	12.33	4.57	0.00	0.00	0.00
26	7.35	4.24	2.16	7.35	4.24	2.22	0.00	0.00	0.00
27	27.13	18.00	15.70	27.13	18.00	15.87	0.01	0.00	0.00
28	5.00	3.00	0.42	5.00	3.00	0.44	0.00	0.00	0.00
29	35.10	27.95	8.40	35.10	27.95	8.71	0.01	0.00	0.00
30	27.50	25.75	11.35	27.50	25.75	11.42	0.01	0.00	0.00
31	27.28	47.91	15.35	26.83	47.55	16.38	0.00	0.00	0.01