Oikos

OIK-05903

de Arruda Almeida, B., Sebastián-González, E., dos Anjos, L., Green, A. J. and Botella, F. 2019. A functional perspective for breeding and wintering waterbird communities: temporal trends in species and trait diversity. – Oikos doi: 10.1111/oik.05903

Appendix 1

Table A1. Species found in the study area and yearly mean abundances for the breeding and wintering periods.

Taxa	Common names	Yearly mean abundance	
		Wintering	Breeding
ANSERIFORMES			
Anatidae	**Ducks, geese, swans**		
Oxyura leucocephala	White-headed duck	374	49
Anser anser	Greylag goose	6	0
Tadorna tadorna	Common shelduck	1,054	13
Marmaronetta angustirostris	Marbled teal	21	35
Netta rufina	Red-crested pochard	4,819	259
Aythya ferina	Common pochard	2,802	252
Aythya fuligula	Tufted duck	45	0
Aythya nyroca	Ferruginous duck	2	0
Spatula querquedula	Garganey	1	1
Spatula clypeata	Northern shoveler	14,319	2
Mareca strepera	Gadwall	155	24
Mareca penelope	Eurasian wigeon	814	0
Anas platyrhynchos	Mallard	12,335	2142
Anas acuta	Northern pintail	797	0
Anas crecca	Common teal	2,951	0
PODICIPEDIFORMES			
Podicipedidae	**Grebes**		
Tachybaptus ruficollis	Little grebe	650	435
Podiceps cristatus	Great crested grebe	91	97
Podiceps nigricollis	Black-necked grebe	1,010	305
Phoenicopteridae	**Flamingos**		
Phoenicopterus roseus	Greater flamingo	1,958	56

GRUIFORMES			
Rallidae	**Rails, gallinules, coots**		
Porphyrio porphyrio	Purple swamphen	121	180
Fulica cristata	Red-knobbed coot	9	4
Fulica atra	Common coot	5,726	826
PELECANIFORMES			
Threskiornithidae	**Ibises, spoonbills**		
Platalea leucorodia	Eurasian spoonbill	10	0
Plegadis falcinellus	Glossy ibis	584	68
Ardeidae	**Herons**		
Ixobrychus minutus	Common little bittern	4	247
Nycticorax nycticorax	Black-crowned night-heron	110	231
Ardeola ralloides	Squacco heron	2	279
Bubulcus ibis	Cattle egret	4,536	3,149
Ardea cinerea	Grey heron	2,018	504
Ardea purpurea	Purple heron	0	118
Ardea alba	Great white egret	58	0
Egretta garzetta	Little egret	3,709	1,542
CHARADRIIFORMES			
Phalacrocoracidae	**Cormorants**		
Phalacrocorax carbo	Great cormorant	4112	0
SULIFORMES			
Burhinidae	**Thick-knees**		
Burhinus oedicnemus	Eurasian thick-knee	94	4
Recurvirostridae	**Avocets, stilts**		
Recurvirostra avosetta	Pied avocet	716	562
Himantopus himantopus	Black-winged stilt	311	1,204
Charadriidae	**Plovers**		
Pluvialis squatarola	Grey plover	53	0
Pluvialis apricaria	Eurasian golden plover	910	0
Charadrius hiaticula	Common ringed plover	42	0
Charadrius dubius	Little ringed plover	17	88
Charadrius alexandrinus	Kentish plover	179	453
Vanellus vanellus	Northern lapwing	4,454	2
Scolopacidae	**Sandpipers, snipes, phalaropes**		
Numenius arquata	Eurasian curlew	7	0

Limosa lapponica	Bar-tailed godwit	3	0
Limosa limosa	Black-tailed godwit	377	0
Arenaria interpres	Ruddy turnstone	8	0
Calidris pugnax	Ruff	63	0
Calidris alba	Sanderling	103	0
Calidris alpina	Dunlin	873	0
Calidris minuta	Little stint	458	0
Gallinago gallinago	Common snipe	458	0
Lymnocryptes minutus	Jack snipe	1	0
Actitis hypoleucos	Common sandpiper	9	0
Tringa ochropus	Green sandpiper	22	0
Tringa erythropus	Spotted redshank	33	0
Tringa nebularia	Common greenshank	27	0
Tringa totanus	Common redshank	48	0
Tringa glareola	Wood sandpiper	8	0
Glareolidae	**Coursers, pratincoles**		
Glareola pratincola	Collared pratincole	0	214
Laridae	**Gulls, terns, skimmers**		
Hydrocoloeus minutus	Little gull	2	0
Larus genei	Slender-billed gull	177	312
Larus ridibundus	Black-headed gull	30,502	1,165
Larus melanocephalus	Mediterranean gull	57	109
Larus audouinii	Audouin’s gull	386	934
Larus fuscus	Lesser black-backed gull	2,538	0
Larus michahellis	Yellow-legged gull	3,845	0
Larus cachinnans	Caspian gull	0	119
Sternula albifrons	Little tern	0	404
Gelochelidon nilotica	Common gull-billed tern	0	460
Chlidonias hybrida	Whiskered tern	3	618
Sterna hirundo	Common tern	0	1,911
Thalasseus sandvicensis	Sandwich tern	128	1,083
ACCIPITRIFORMES			
Pandionidae	**Osprey**		
Pandion haliaetus	Osprey	4	0
Accipitridae	**Hawks, eagles**		
Circus aeruginosus	Long-winged Harrier	191	2

Table A2. General additive mixed modeling of alpha diversity through time for wintering and breeding waterbird communities in Valencian wetlands. Significant p-values are shown in bold.

	Estimated degrees of freedom	F statistics	p-value	Adj. R-square
Wintering SR	2.463	9.879	**<0.001**	0.054
Wintering FRic	2.909	27.38	**<0.001**	0.132
Wintering FEve	1	2.728	0.010	0.001
Wintering FDiv	1	0.685	0.409	-0.003
Wintering FDis	2.13	12.62	**<0.001**	0.093
Breeding SR	1	48.71	**<0.001**	0.134
Breeding FRic	1	24.67	**<0.001**	0.099
Breeding FEve	2.327	1.716	0.280	0.019
Breeding FDiv	1	20.88	**<0.001**	0.081
Breeding FDis	1	0.003	0.953	-0.003

Table A3. General additive mixed modeling of CWM through time for wintering and breeding waterbird communities in Valencian wetlands. Significant p-values are shown in bold.

	Estimated degrees of freedom	F statistics	p-value	Adj. R-square
Wintering – Invertebrate in diet	1	1.565	0.212	0.019
Wintering – Fish in diet	1	14.95	**<0.001**	0.049
Wintering – Body mass	1	22.78	**<0.001**	0.145
Wintering – Diet plasticity	1	1.934	0.165	0.006
Wintering – Strata plasticity	1	7.885	**0.005**	0.040
Breeding – Invertebrate in diet	1	13.35	**<0.001**	0.089
Breeding – Fish in diet	1	21.17	**<0.001**	0.073
Breeding – Body mass	1	11.03	**0.001**	0.056
Breeding – Diet plasticity	1	9.577	**0.002**	0.073
Breeding – Strata plasticity	1	4.47	**0.035**	0.032

Table A4. General additive modeling of spatial beta diversity through time for wintering and breeding waterbird communities in Valencian wetlands. Significant p-values are shown in bold.

	Estimated degrees of freedom	F statistics	p-value	Adj. R-square
Wintering taxonomic beta	2.324	6.227	**0.0036**	0.381
Wintering functional beta	4.789	5.856	**<0.001**	0.894
Breeding taxonomic beta	4.742	18.19	**<0.001**	0.8
Breeding functional beta	1	19.64	**<0.001**	0.418

Table A5. General additive mixed modeling of beta diversity between wintering and breeding waterbirds through time in Valencian wetlands. Significant p-values are shown in bold.

	Estimated degrees of freedom	F statistics	p-value	Adj. R-square
Taxonomic beta	1	61.02	**<0.001**	0.251
Functional beta	1	3.395	**0.066**	0.011

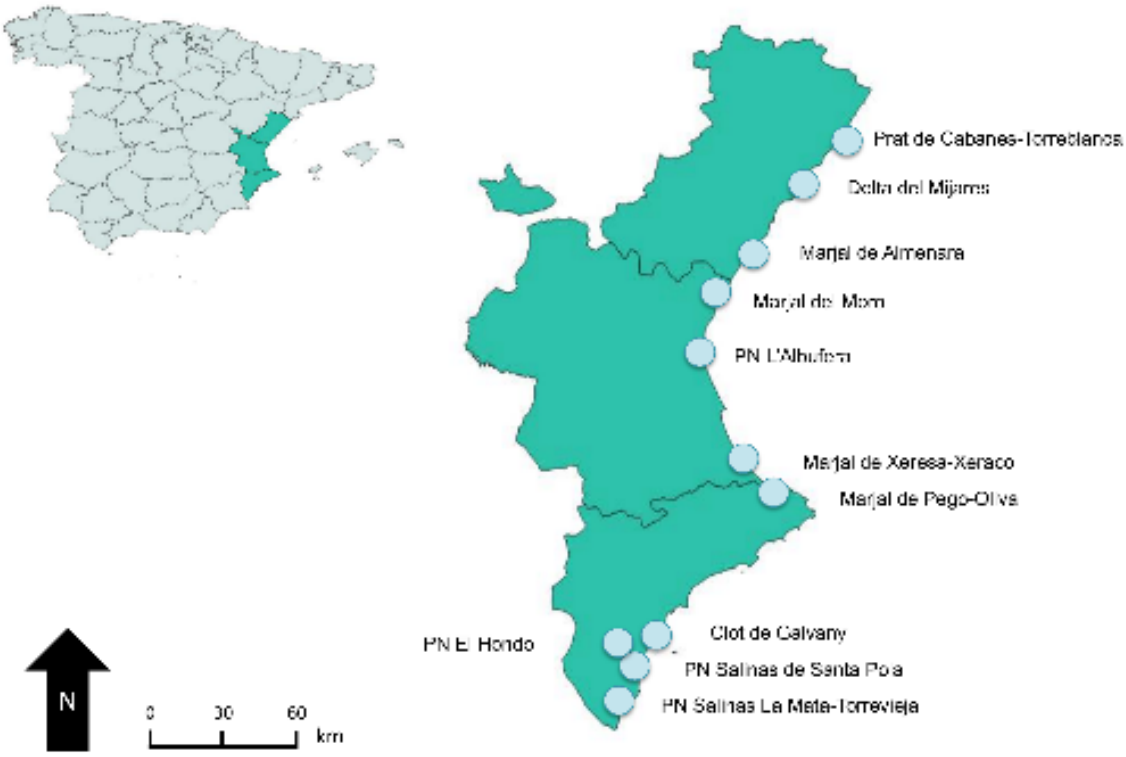

Figure A1. Map of the Valencian Community (SE Spain) showing the 11 protected wetlands used in the study.

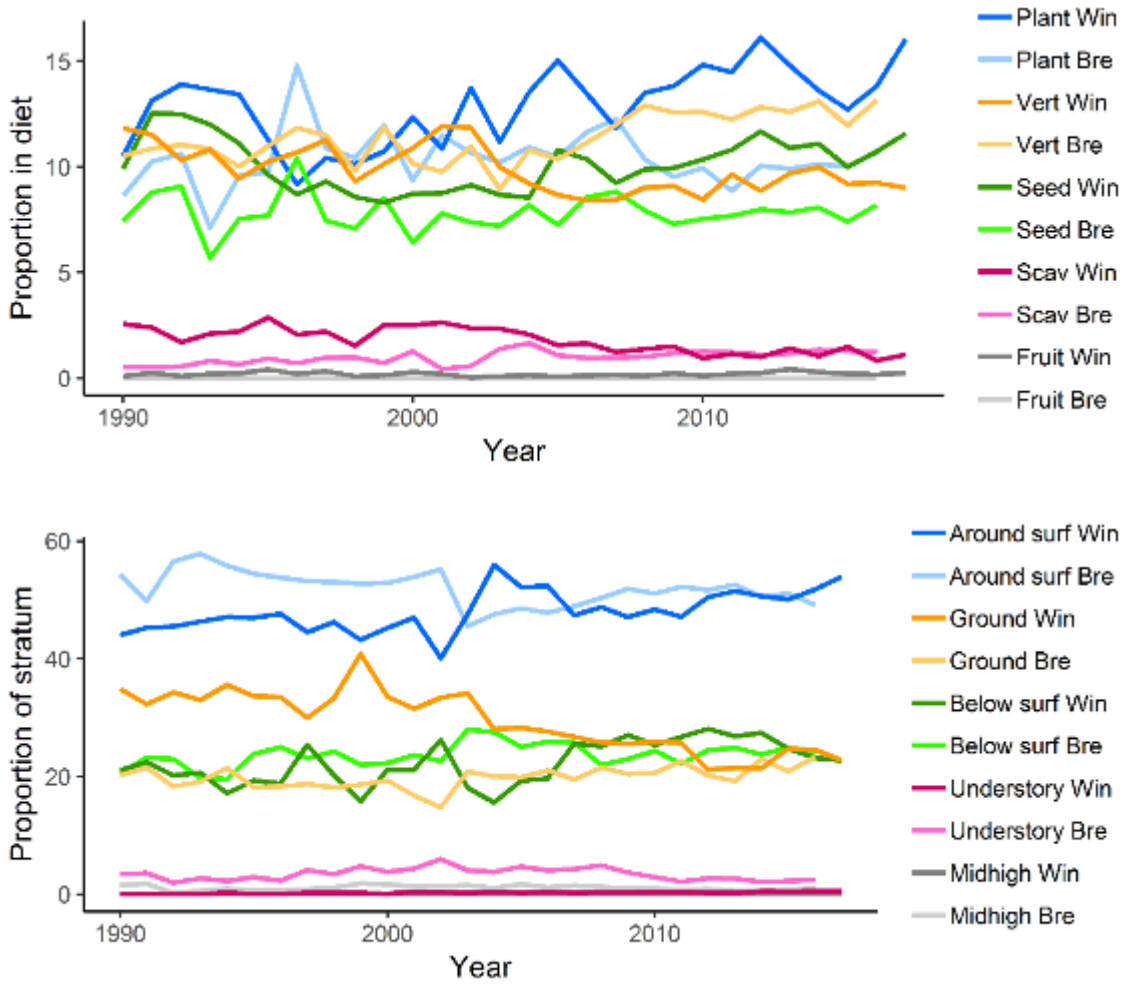

Figure A2. Mean CWM values per year of (a) proportions of items in the diet and (b) proportions of foraging strata for wintering and breeding waterbird communities in the Valencian wetlands. Plant: plant material; Vert: vertebrates; Scav: scavenge; Around surf: around surface; Below surf: below surface; Win: wintering; Bre: breeding.

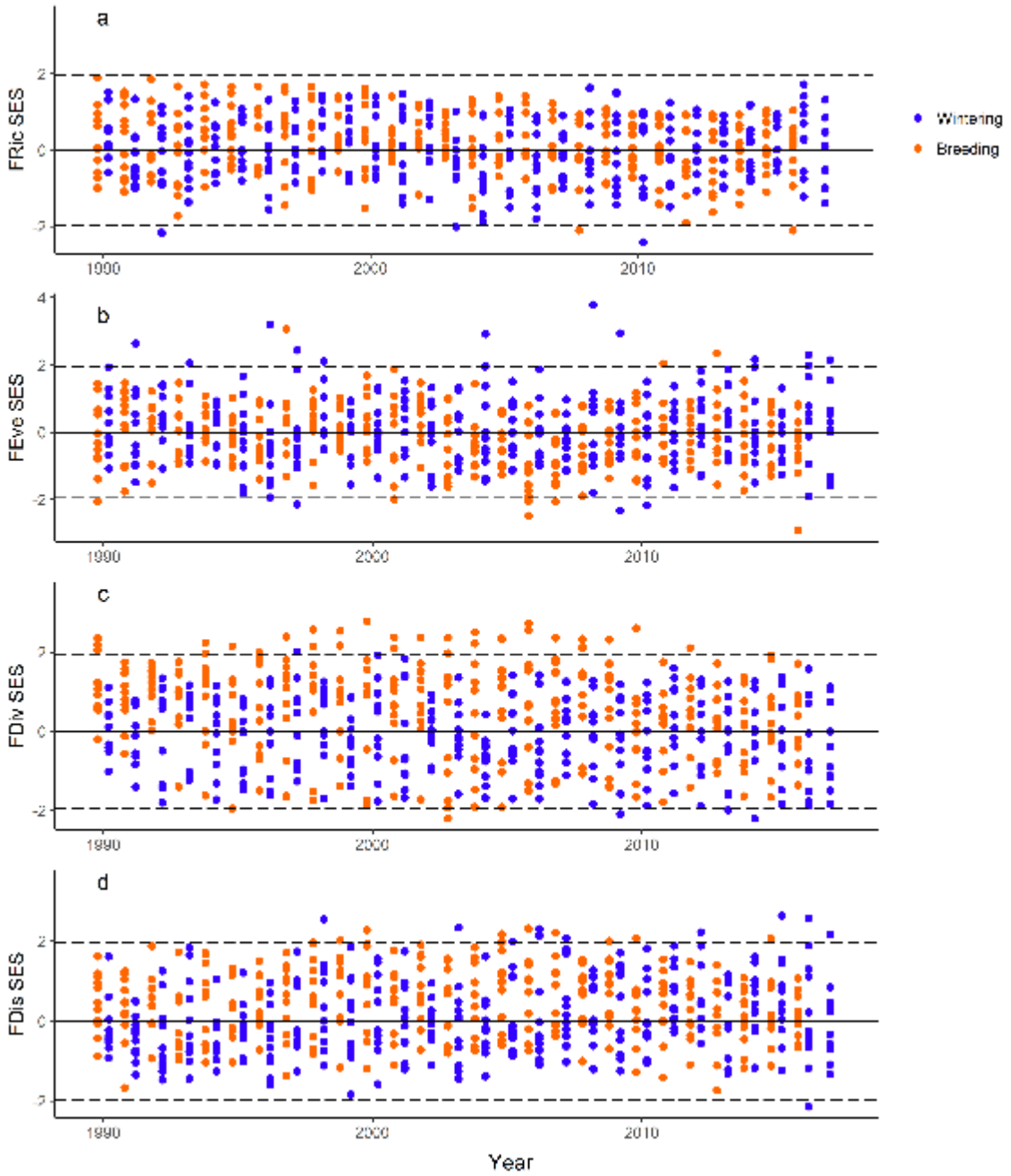

Figure A3. Standardized effect sizes for differences between observed and expected values in each community generated by null model 1 for (a) functional richness, (b) functional evenness, (c) functional divergence, and (d) functional dispersion. Points below the inferior dashed line or above the superior dashed line indicate statistically significant departures from the expected alpha functional diversity.

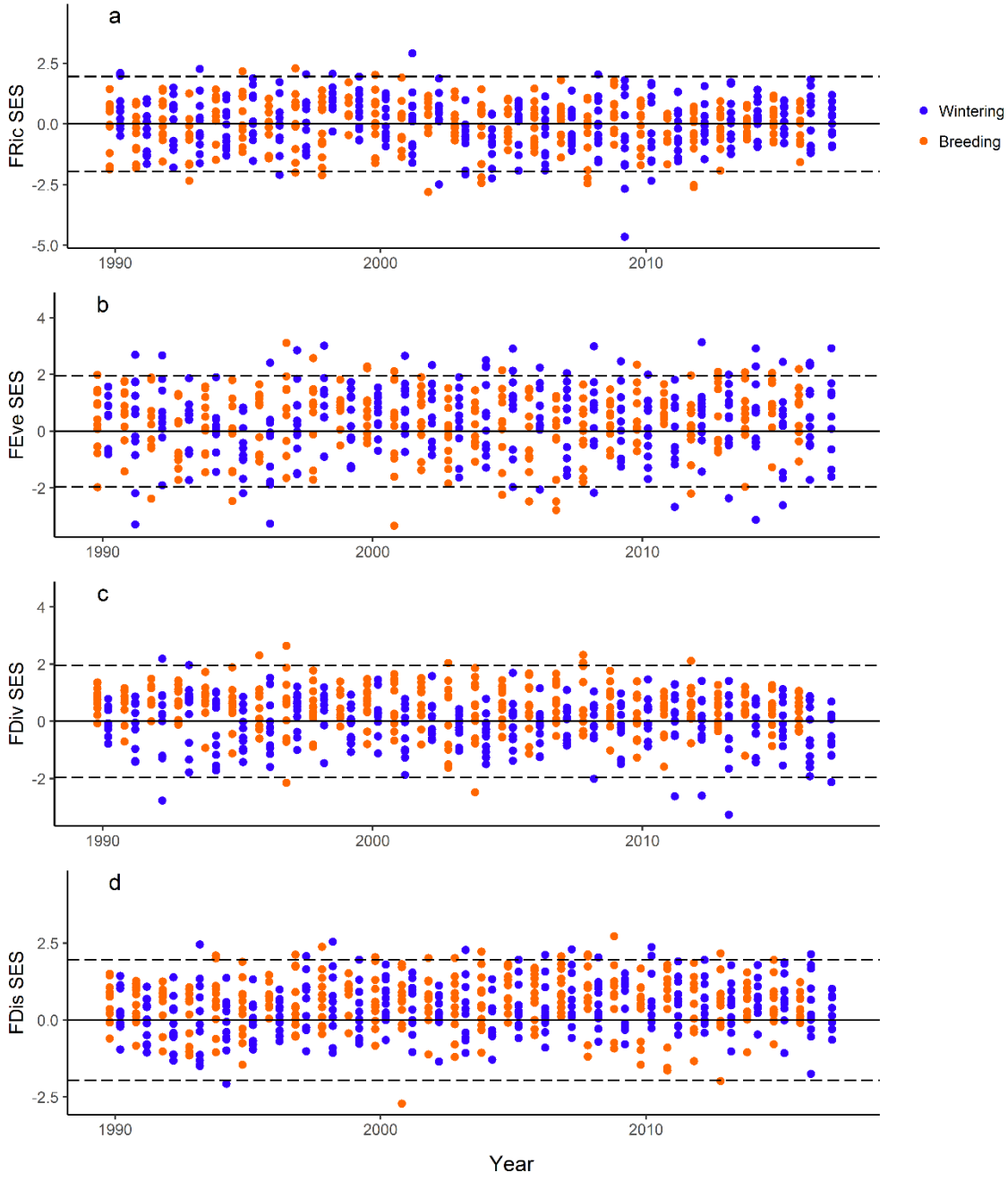

Figure A4. Standardized effect sizes for differences between observed and expected values in each community generated by null model 2 (retaining species richness and occurrence rates) for (a) functional richness, (b) functional evenness, (c) functional divergence, and (d) functional dispersion. Points below the inferior dashed line or above the superior dashed line indicate statistically significant departures from the expected alpha functional diversity.