Supplementary material

Enzo Degot*, Ralf Wistbacka, Konsta Kaasalainen, Aleksi Lehikoinen & Laura Bosco 2024: Effects of predation pressure and nest-site selection on the breeding success of terns in a Finnish archipelago. — Ornis Fennica 101: 76–90.

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Section S1: Collinearity of explanatory variables and overview of global models

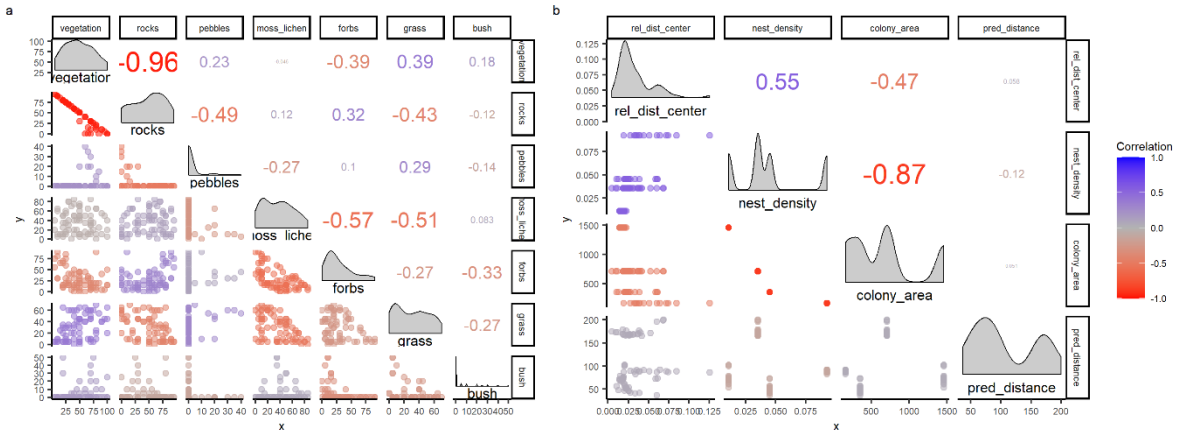

Fig. S1. Pearson correlations among all continuous predictor variables that were included in the modeling separately for a) the local nest-site habitat models and b) the nest position models.

List S1. Overview of collinear variables and which of them were selected for the global model per response variable thereafter.

1) Hatching success

Local nest-site habitat variables (Fig. S1a):

- Vegetation and rocks (Pearson = –0.96): keep rocks, drop vegetation
- Moss/lichen and forbs (Pearson = –0.51): keep forbs, drop moss/lichen
- Grass and moss/lichen (Pearson = –0.51): keep grass, drop moss/lichen

Nest position variables (Fig. S1b):

- Nest density and colony area (Pearson = –0.87): keep colony area, drop nest density

2) Number of fledglings

Local nest-site habitat variables (Fig. S1a):

- Vegetation and rocks (Pearson = –0.96): keep rocks, drop vegetation
- Moss/lichen and forbs (Pearson = –0.51): keep moss/lichen, drop forbs
- Grass and moss/lichen (Pearson = –0.51): keep grass, drop moss/lichen

Nest position variables (Fig. S1b):

- Nest density and colony area (Pearson = –0.87): keep colony area, drop nest density

List S2. Overview of global models fitted for the local nest-site habitat variables and the nest position variables per response variable. From those, stepwise backward model selection was performed.

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1) Hatching success

Local nest-site habitat variables:

glm(prop_hatched_egg ~ rocks.std + pebbles.std + forbs.std + grass.std + bush.std, family = quasibinomial, data=terns_df)

Nest position variables:

glm(prop_hatched_egg ~ colony_area.std + rel_dist_center.std + dist_pred.std, family = quasibinomial, data=terns_df)

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2) Number of fledglings

Local nest-site habitat variables:

glm.nb(nb_fledging ~ rocks.std + pebbles.std + grass.std + forbs.std, data = terns_df)

Nest position variables:

glm.nb(nb_fledging ~ rel_dist_center.std + dist_pred.std, data = terns_df)

Section S2: Detailed description of breeding monitoring per colony

Northern colony — The northern colony was exclusively populated by CTs. It consisted of 16 nests, with an average of 2.9 eggs per nest (range 2 to 3 eggs). The average hatching date for the colony was 21 June, with the first hatching occurring on June 13th. Out of the 46 eggs counted in the colony, 32 hatched, while the others were preyed upon, resulting in a hatching success rate of 70%. However, none of the chicks from this colony appear to have fledged (breeding success null) (Table 2).

Eastern colony — Located at the east of Hällgrund, this colony was composed exclusively of ATs. It consisted of 25 nests, containing 1 to 2 eggs each, with an average of 1.8 eggs per nest. On average, the hatching date was 23 June. The first hatching in this colony was the 17th of June. Out of the 45 eggs in this colony, 35 hatched, resulting in a hatching success rate of 78%. Similar to the previous colony, this one also experienced a complete failure of breeding success with no chicks reaching the fledgling stage (Table 2).

Western colony — The colony located on the west side of the island consisted of 16 nests, hosting both CTs and ATs, with a predominance of the second species. The nests contained 1 to 3 eggs, with an average of 1.9 eggs per nest. First chicks to hatch were on the 17th of June and the 25 June on average. Out of the 30 eggs in the colony, 14 hatched, resulting in a hatching success rate of 47%. The hatching success was relatively low compared to other colonies, and the fledgling success was a complete failure here as well (Table 2).

Southern colony — The colony of terns located farthest to the south consisted of 15 nests of both species, with a predominance of CTs. It was situated on the island of Lilliberget, to the south of the main island of Hällgrund (Fig. 1). The nests contained 2 to 3 eggs, with an average of 2.6 eggs per nest. The 23 June was the average of hatching dates, with earliest hatching on the 18th of June. The colony had a total of 39 eggs, and 30 of them hatched, resulting in a hatching success rate of 77%. The colony appeared to have 14 chicks that have reached fledgling stage (47% fledging success, Table 2).

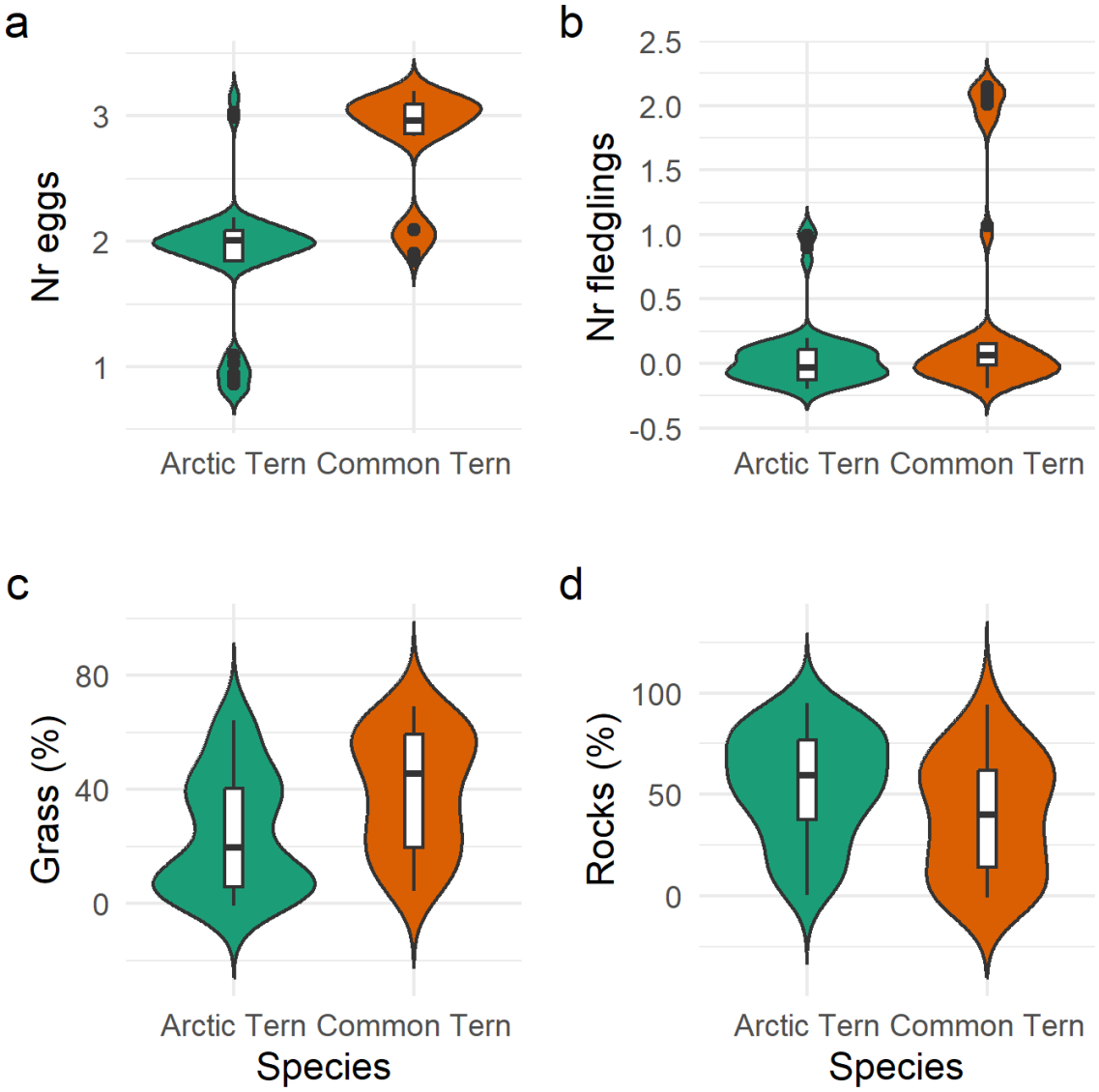

Fig. S2. Violin plots showing the raw data for the significant species differences in a) the number of eggs per nest, b) the number of fledglings produced, c) the percentage of grass, and d) rocks coverage around the nest within $1m^2$.

Table S1. Global models for hatching success for A) the local habitat variables 1m² around the nest and B) the nest position variables. Given are the model estimates, standard errors (SE), t- and p-values. Significant or near-significant (p<0.1) variables are shown in bold. From these full models we performed stepwise backward selection with best model results shown in the main text.

Variable	Estimate	SE	t	P
A) Local habitat; Tjur's R^2 = 15.5				
Intercept	0.825	0.231	3.567	0.001
Rocks	**–0.570**	**0.321**	**–1.775**	**0.081**
Pebbles	0.075	0.339	0.223	0.825
Forbs	–0.222	0.265	–0.837	0.405
Grass	–0.072	0.277	–0.260	0.795
Bushes	0.059	0.280	0.210	0.834
B) Nest position; Tjur's R^2 = 15.2				
Intercept	0.806	0.225	3.583	<0.001
Colony area	**–0.455**	**0.242**	**–1.882**	**0.064**
Distance center	0.198	0.291	0.682	0.498
Distance predator	0.290	0.227	1.281	0.205

Table S2. Global models for number of fledglings for A) the local habitat variables 1m² around the nest and B) the nest position variables. Given are the model estimates, standard errors (SE), t- and p-values. Significant or near-significant (p<0.1) variables are shown in bold. The best model after model selection is shown in the main manuscript. From these full models we performed stepwise backward selection with best model results shown in the main text.

Variable	Estimate	SE	t	P
A) Local habitat; Nagelkerke's R^2 = 63.4				
Intercept	–3.482	0.833	–4.183	>0.001
Rocks	**–0.854**	**0.365**	**–2.337**	**0.019**
Pebbles	–0.217	0.191	–1.136	0.256
Grass	**1.903**	**0.640**	**2.972**	**0.003**
Forbs	**1.212**	**0.551**	**2.199**	**0.028**
B) Nest position; Nagelkerke's R^2 = 32.6				
Intercept	–2.481	0.595	–4.169	>0.001
Distance predator	–0.240	0.429	–0.558	0.577
Distance center	**–1.567**	**0.647**	**–2.421**	**0.016**

Table S3. Total observation hours, number of predation (pred) events per colony, with number of successful predations, number of defended attacks and thereafter the attack rate (# attacks/h), defend rate (# defenses/h), as well as the success rate (rate of successful predations as # successful predations/# predation events). The last two columns describe the number of attacks by European Herring gulls and attacks by other species.

Colony	Obs hours	# pred events	# successful preds	# defended	Attack rate	Defend rate	Success rate	# LarArg	# other
1	16.25	30	2	15	1.85	0.92	0.07	30	0
2	7.5	3	1	1	0.4	0.13	0.33	3	0
3	11.6	17	3	9	1.47	0.78	0.18	14	3
4	8	15	0	9	1.88	1.13	0	10	5
TOTAL	43.35	65	6	34	1.40	0.74	0.14	57	8

Table S4. Breeding success of Arctic and Common Terns on Hällgrund islands in some of the previous years (2011–2022).

Site	Year	Species	Pairs	Fledglings/Pair	Notes
Lillberget	2011	CT and AT	22	0.09	Predator Lar Arg on Lillberget
Mellanberget	2012	CT and AT	14	0	Predator Lar Arg on Lillberget
Lillberget	2012	CT and AT	12	0.25	Predator Lar Arg on Lillberget
Hellgrund	2012	AT	5	0.6	No pred Lar Arg
Lillberget	2013	CT and AT	26	0.07	Predator Lar Arg on Lillberget
Hellgrund	2013	CT and AT	24	0.66	No pred Lar Arg
Hellgrund	2013	CT and AT	16	0.56	No pred Lar Arg
Hellgrund	2013	AT	3	1	No pred Lar Arg
Hellgrund	2020	CT	9	0	Predator Lar Arg on Hellgrund!
Hellgrund	2020	AT	21	0	Predator Lar Arg on Hellgrund!
Hellgrund	2020	AT	14	0	Predator Lar Arg on Hellgrund!
Hellgrund	2020	AT	29	0.3	Predator Lar Arg on Hellgrund!
Lillberget	2020	CT	5	0	Predator Lar Arg on Mellanberget
Hellgrund	2021	AT	32	0.06	Predator Lar Arg on Hellgrund!
Hellgrund	2021	CT and AT	15	0.13	Predator Lar Arg on Hellgrund!
Hellgrund	2021	AT	8	0,77	Predator Lar Arg on Hellgrund!
Hellgrund	2021	CT	1	0	Predator Lar Arg on Hellgrund!
Hellgrund	2022	AT	25	0.04	Predator Lar Arg on Hellgrund!
Hellgrund	2022	CT and AT	25	0	Heavy thunderstorm 2-3.7!!
Hellgrund	2022	CT and AT	25	0	Heavy thunderstorm 2-3.7!!

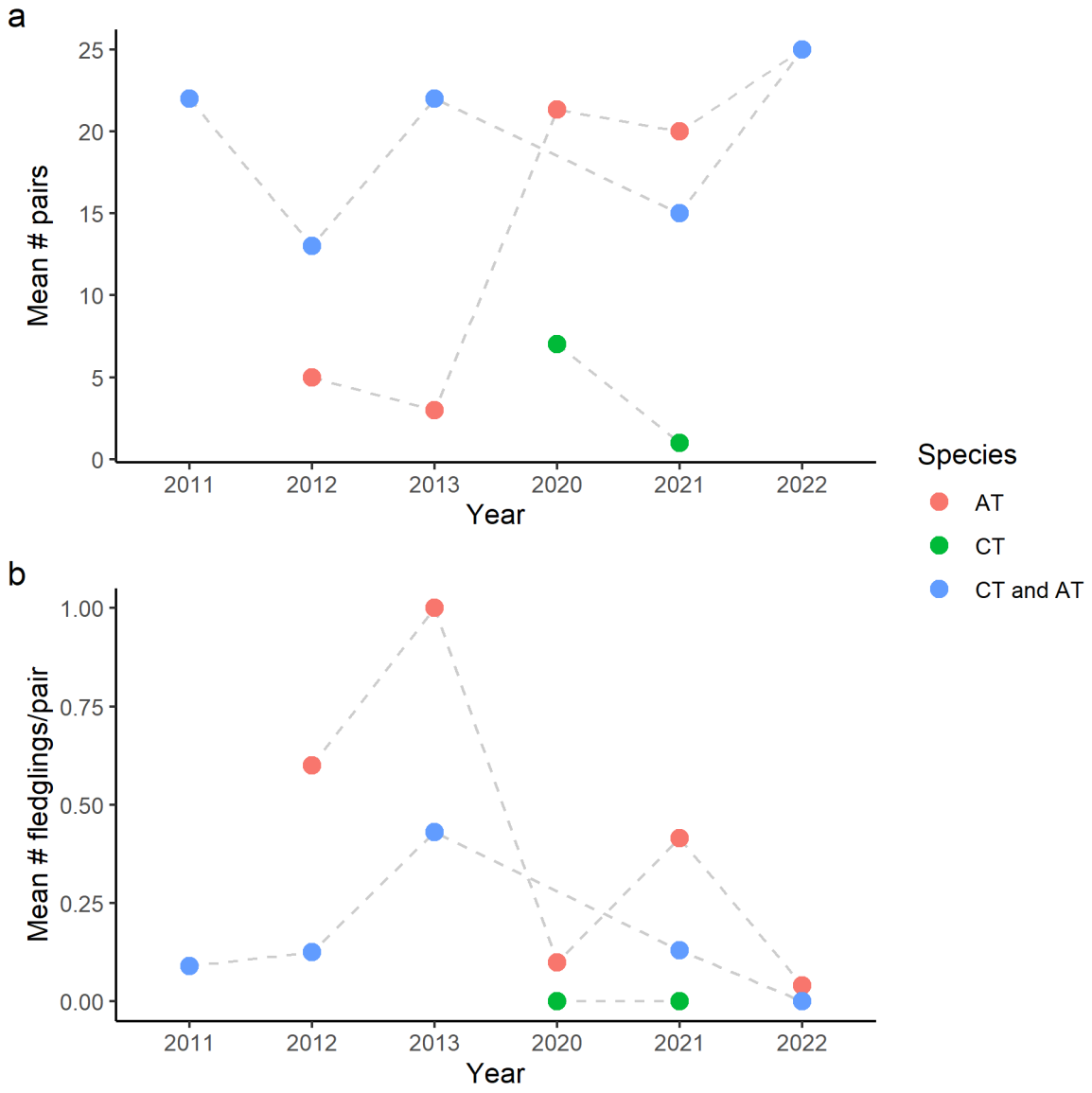

Fig. S3. Colony sizes and breeding success of terns on Hällgrund islands in previous years. a) Mean number of tern pairs per year and per colony type (i.e. pure AT, CT or mixed AT and CT colonies). b) Mean number of fledglings per pair against the year and again colored per colony type.