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Supplementary material

Reproductive strategy of *Scyliorhinus canicula* (L., 1758): a holistic approach based on macroscopic measurements and microscopic observations of the reproductive organs

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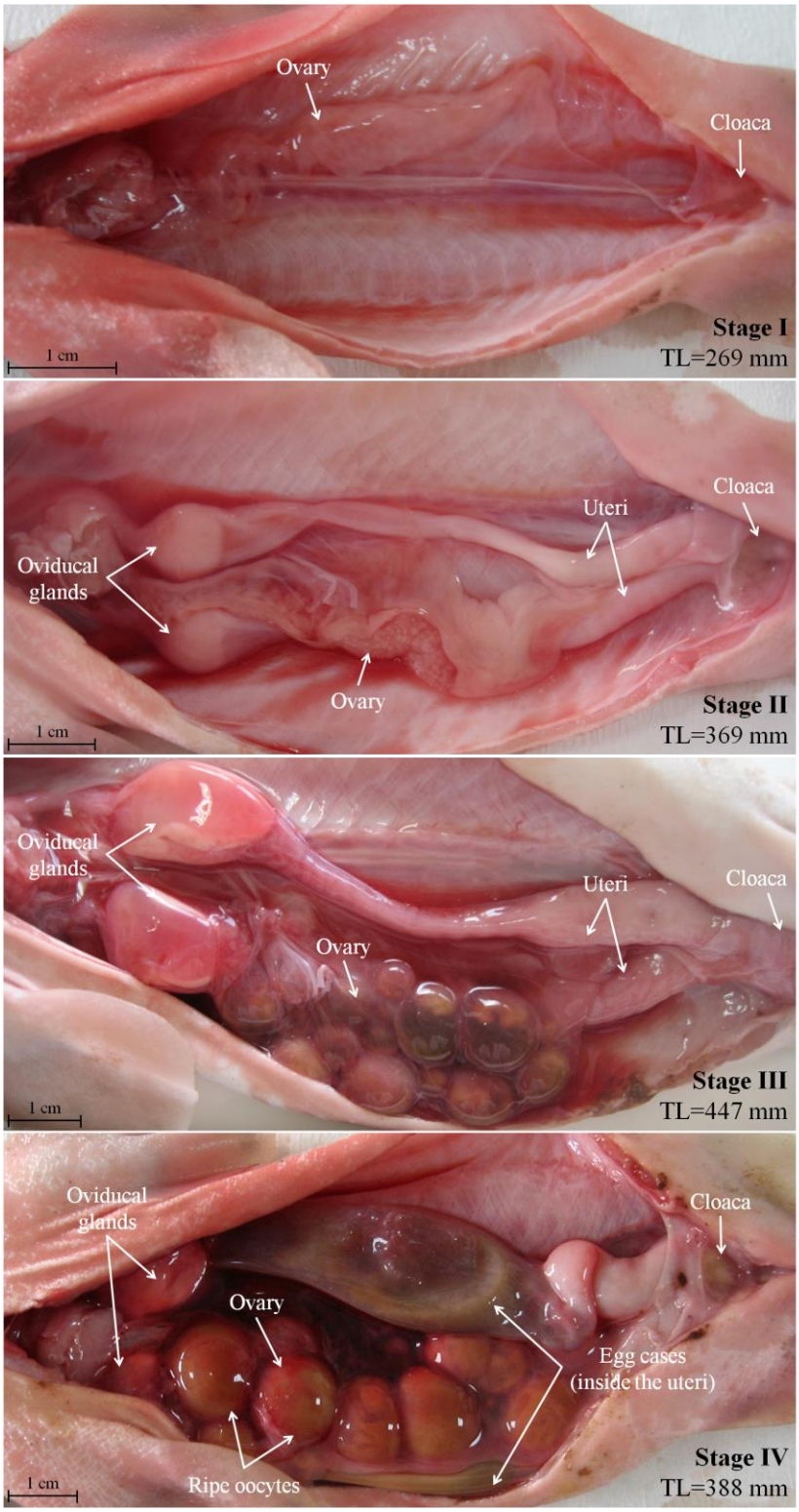

Fig. S1. Sexual maturity stages (I–IV) of female *Scyliorhinus canicula* (liver, stomach and intestine have been removed). Photos by Vasiliki Kousteni.

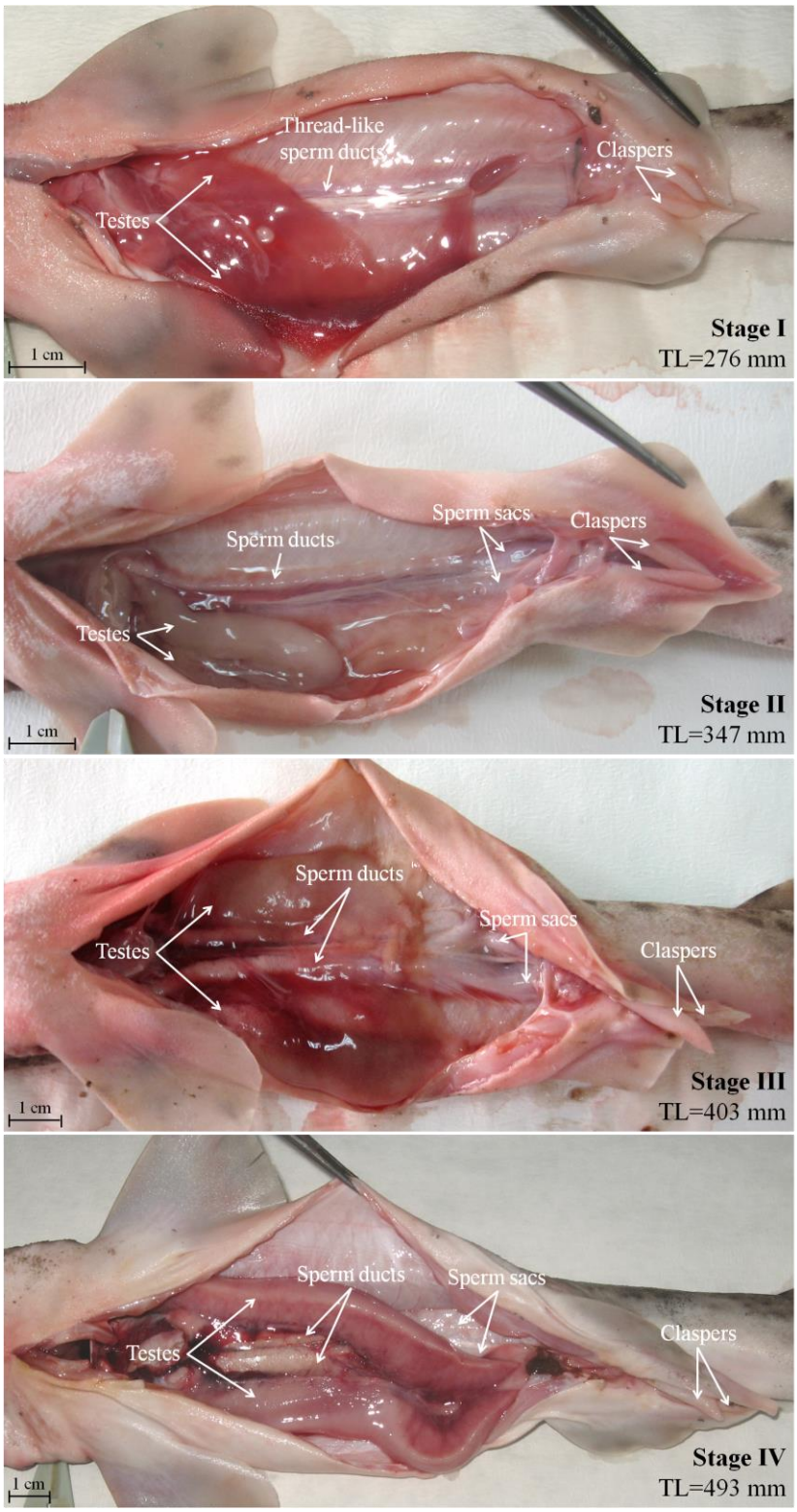

Fig. S2. Sexual maturity stages (I–IV) of male *Scyliorhinus canicula* (liver, stomach and intestine have been removed). Photos by Vasiliki Kousteni.

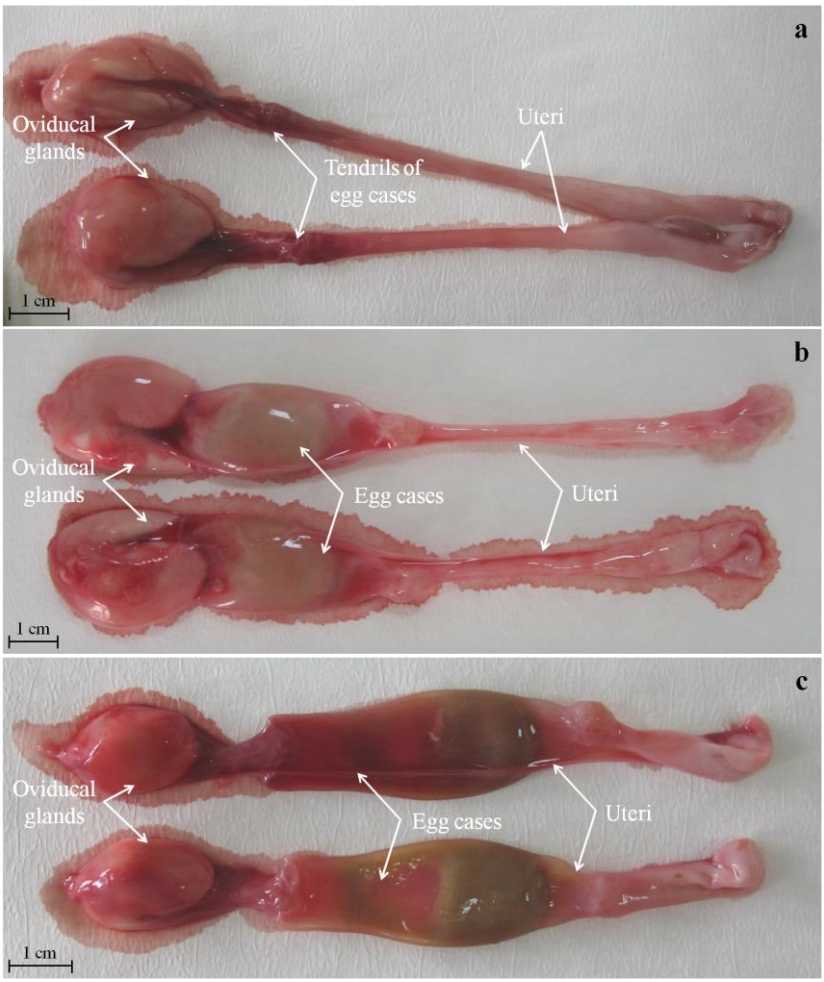

Fig. S3. Reproductive tract of gravid female *Scyliorhinus canicula* with egg cases in different stages of development: (a) only tendrils formed; (b) only the posterior part of the egg cases has been produced; and (c) egg cases completely formed and sealed in the uteri. Photos by Vasiliki Kousteni.

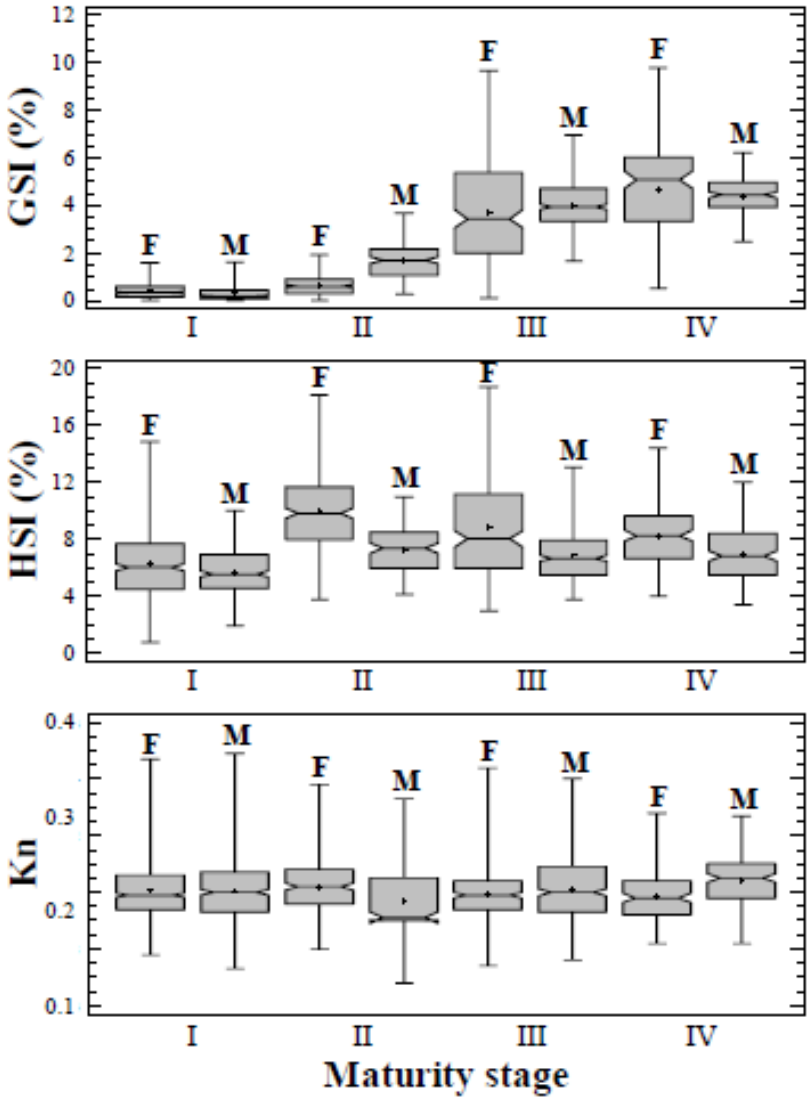

Fig. S4. Box-and-whisker plots of gonadosomatic index (GSI), hepatosomatic index (HSI) and relative condition factor (Kn) in each maturity stage (I–IV) for female (F) and male (M) *Scyliorhinus canicula*; grey area, 50% of the values; cross (+), mean; horizontal line, median; notch, 95% confidence level for median; vertical lines, minimum and maximum.

Table S1. Descriptive statistics of the reproductive organs, liver measurements, somatic indices and body size of female *Scyliorhinus canicula* in each maturity stage

n, number of individuals; s.d., standard deviation

Measurement Symbol	Description	*n*	Mean	s.d.	Range	*n*	Mean	s.d.	Range
				I				II	
OL	Ovary length (mm)	215	50.1	20.0	8.00–116	190	75.3	17.7	33.0–123
OWi	Ovary width (mm)	180	4.29	2.19	1.00–10.0	151	7.90	3.38	2.00–18.1
Owe	Ovary weight (g)	275	0.30	0.38	0.00–1.90	193	0.96	0.72	0.01–3.51
LOGL	Left oviducal gland length (mm)	63	10.8	4.29	4.00–22.0	221	17.0	3.35	8.00–25.0
LOGWi	Left oviducal gland width (mm)	63	5.27	2.96	2.00–12.0	221	8.63	2.00	3.00–16.0
LOGWe	Left oviducal gland weight (g)	63	0.13	0.16	0.0004–0.58	221	0.44	0.00	0.02–1.80
ROGL	Right oviducal gland length (mm)	44	9.48	4.15	4.00–22.0	199	17.0	3.47	7.00–25.0
ROGWi	Right oviducal gland width (mm)	44	3.95	2.02	2.00–9.00	199	8.44	2.16	3.00–16.0
ROGWe	Right oviducal gland weight (g)	44	0.06	0.11	0.0003–0.53	199	0.42	0.28	0.02–1.90
LUL	Left uterus length (mm)	33	50.3	7.45	35.0–68.0	193	65.6	13.2	41.0–112
LUWi	Left uterus width (mm)	60	1.77	0.99	0.50–5.00	209	4.42	1.69	1.00–10.0
LUWe	Left uterus weight (g)	6	0.27	0.19	0.06–0.49	174	0.42	0.26	0.04–1.40
RUL	Right uterus length (mm)	33	51.4	7.77	37.0–72.0	193	66.1	13.0	38.0–110
RUWi	Right uterus width (mm)	60	1.80	1.00	0.50–5.00	209	4.00	1.72	1.00–10.0
RUWe	Right uterus weight (g)	6	0.22	0.15	0.05–0.45	174	0.44	0.28	0.04–1.60
LL	Liver length (mm)	437	53.0	25.3	7.00–120	232	103	19.1	55.0–149
LWe	Liver weight (g)	437	3.66	3.83	0.02–22.7	231	14.6	6.58	4.10–36.0
GSI	Gonadosomatic index	276	0.41	0.31	0.00–1.61	192	0.64	0.40	0.01–1.91
HSI	Hepatosomatic index	437	6.33	2.37	0.75–14.8	230	9.97	2.99	3.73–18.2
Kn	Relative condition factor	530	1.01	0.10	0.78–1.47	249	1.02	0.10	0.80–1.38
TL	Total length (mm)	530	252	69.5	89–395	249	376	28.8	265–447
				III				IV	
OL	Ovary length (mm)	183	96.9	23.3	47.0–177	124	104	24.0	48.0–157
OWi	Ovary width (mm)	118	20.5	5.97	10.0–35.0	83	21.9	6.22	8.00–40.0
Owe	Ovary weight (g)	190	7.13	4.71	0.27–24.4	125	9.55	5.32	0.80–25.4
LOGL	Left oviducal gland length (mm)	192	23.1	3.21	14.0–31.0	126	24.4	3.54	18.0–45.0
LOGWi	Left oviducal gland width (mm)	192	14.7	2.66	9.00–24.0	126	17.2	2.71	12.0–29.0
LOGWe	Left oviducal gland weight (g)	192	2.00	0.75	0.18–4.29	126	2.42	0.67	1.20–4.80
ROGL	Right oviducal gland length (mm)	148	23.0	3.22	14.0–30.0	104	24.3	3.50	18.0–44.0
ROGWi	Right oviducal gland width (mm)	148	15.0	2.70	7.00–23.0	104	17.2	2.61	10.0–27.0
ROGWe	Right oviducal gland weight (g)	148	2.06	0.78	0.05–4.41	104	2.00	0.66	1.24–5.10
LUL	Left uterus length (mm)	148	90.0	12.7	61.0–129	104	99.6	12.2	64.0–128
LUWi	Left uterus width (mm)	175	7.30	2.03	3.00–18.0	124	15.4	3.84	5.00–21.0
LUWe	Left uterus weight (g)	148	1.20	0.38	0.19–2.51	103	3.38	1.26	0.63–5.50
RUL	Right uterus length (mm)	148	90.3	11.7	62.0–130	104	99.9	11.1	71.0–126
RUWi	Right uterus width (mm)	175	7.31	2.07	2.00–19.0	124	15.5	3.89	5.00–22.0
RUWe	Right uterus weight (g)	148	1.20	0.35	0.20–2.55	103	3.45	1.25	0.74–5.46
LL	Liver length (mm)	197	117	19.9	75.0–172	130	120	20.3	75.0–165
LWe	Liver weight (g)	197	17.0	8.18	5.38–49.4	129	16.6	5.73	6.20–32.9
GSI	Gonadosomatic index	190	3.73	2.19	0.12–9.66	125	4.69	2.14	0.52–9.77
HSI	Hepatosomatic index	197	8.84	3.48	2.95–18.7	129	8.25	2.18	4.00–14.4
Kn	Relative condition factor	203	0.99	0.09	0.74–1.44	130	0.98	0.09	0.82–1.28
TL	Total length (mm)	203	412	25.4	361–492	130	418	26.4	349–480

Table S2. Descriptive statistics of the reproductive organs, liver measurements, somatic indices and body size of male *Scyliorhinus canicula* in each maturity stage

n, number of individuals; s.d., standard deviation

Measurement		I				II			
Symbol	Description	*n*	Mean	s.d.	Range	*n*	Mean	s.d.	Range
LTL	Left testis length (mm)	71	29.9	10.5	8.00–59.0	119	47.3	11.8	25.0–89.0
LTWi	Left testis width (mm)	119	3.09	1.43	1.00–8.00	82	8.31	2.37	3.00–14.0
LTWe	Left testis weight (g)	159	0.11	0.14	0.00–1.01	121	1.05	0.55	0.10–2.48
RTL	Right testis length (mm)	71	48.3	12.2	18.0–76.0	119	62.8	12.1	41.0–101
RTWi	Right testis width (mm)	119	3.11	1.38	1.00–7.00	82	7.86	2.23	4.00–14.0
RTWe	Right testis weight (g)	159	0.11	0.16	0.00–1.12	121	1.17	0.61	0.10–2.77
LCLO	Left clasper outer length (mm)	411	4.83	2.56	1.00–18.0	130	17.7	4.34	6.00–25.0
LCLI	Left clasper inner length (mm)	411	10.6	4.23	3.00–27.0	130	27.7	4.82	13.0–36.0
LCLB	Left clasper base width (mm)	411	1.94	0.75	1.00–4.00	130	4.14	0.95	2.00–7.00
LL	Liver length (mm)	371	49.3	20.3	12.0–105	124	87.5	14.3	60.0–118
LWe	Liver weight (g)	371	2.71	2.36	0.10–9.55	124	9.39	2.97	4.32–16.9
GSI	Gonadosomatic index	159	0.29	0.27	0.00–1.64	120	1.70	0.77	0.26–3.68
HSI	Hepatosomatic index	370	5.72	1.66	1.89–9.99	124	7.28	1.61	4.10–11.0
Kn	Relative condition factor	447	1.01	0.10	0.73–1.49	130	0.96	0.10	0.68–1.33
TL	Total length (mm)	447	247	60.0	110–382	130	368	21.4	326–416
				III				IV	
LTL	Left testis length (mm)	394	74.4	14.5	36.0–118	150	80.4	15.5	47.0–125
LTWi	Left testis width (mm)	263	13.1	2.47	7.00–20.0	150	14.3	2.39	9.00–20.0
LTWe	Left testis weight (g)	395	3.81	1.36	1.20–7.61	150	4.90	1.43	1.85–9.80
RTL	Right testis length (mm)	394	89.9	15.2	51.0–134	150	98.9	16.7	58.0–145
RTWi	Right testis width (mm)	263	12.0	2.48	7.00–20.0	150	13.4	2.49	7.00–23.0
RTWe	Right testis weight (g)	395	4.11	1.50	1.10–9.76	150	5.36	1.80	2.10–11.0
LCLO	Left clasper outer length (mm)	410	22.8	2.17	17.0–30.0	154	23.7	2.25	18.0–29.0
LCLI	Left clasper inner length (mm)	410	32.8	2.62	26.0–41.0	154	34.1	2.72	28.0–42.0
LCLB	Left clasper base width (mm)	410	5.25	0.83	3.00–8.00	154	5.98	0.84	4.00–8.00
LL	Liver length (mm)	397	104	18.0	59.0–150	150	111	18.7	75.0–162
LWe	Liver weight (g)	397	13.4	4.81	5.46–34.5	150	16.1	6.44	6.70–41.9
GSI	Gonadosomatic index	395	4.03	0.96	1.65–6.96	150	4.44	0.76	2.46–6.21
HSI	Hepatosomatic index	397	6.89	1.80	3.73–13.1	150	6.95	2.00	3.38–12.0
Kn	Relative condition factor	410	1.01	0.11	0.76–1.40	154	1.04	0.09	0.82–1.27
TL	Total length (mm)	410	417	26.4	350–489	154	439	27.1	390–517

Table S3. Power regression coefficients describing the relationships between total length (TL) and total weight (TW), the measurements of the reproductive organs and liver of female and male *Scyliorhinus canicula*

X, independent variable; *Y*, dependent variable; *n*, number of individuals; α, intercept; b, slope; s.e.$_{(b)}$, standard error of the slope; R^2, coefficient of correlation; asterisks (*) indicate the best fit linear regression model $Y = \alpha + bX$. Symbols are explained in Tables S1 and S2

		Females						Males			
X–*Y*	*n*	α	b	s.e.$_{(b)}$	R^2	*X*–*Y*	*N*	α	b	s.e.$_{(b)}$	R^2
TL–OL	712	0.0026	1.737	0.041	0.72	TL–LTL	734	1×10^{-5}	2.559	0.055	0.75
TL–OWi	532	1×10^{-6}	2.672	0.088	0.64	TL–LTWi	614	1×10^{-6}	2.820	0.047	0.86
TL–OWe	783*	–9.102	0.036	0.002	0.33	TL–LTWe	825*	–6.528	0.024	0.001	0.67
TL–LOGL	602	1×10^{-5}	2.475	0.089	0.57	TL–RTL	734	0.0012	1.851	0.046	0.69
TL–LOGWi	602	2×10^{-9}	3.788	0.123	0.61	TL–RTWi	614	1×10^{-6}	2.645	0.047	0.84
TL–LOGWe	602	1×10^{-29}	11.115	0.333	0.65	TL–RTWe	825*	–7.219	0.027	0.001	0.66
TL–ROGL	495	1×10^{-5}	2.529	0.096	0.58	TL–LCLO	1.105	3×10^{-6}	2.603	0.025	0.90
TL–ROGWi	495	1×10^{-9}	3.908	0.137	0.62	TL–LCLI	1.105	0.0003	1.933	0.015	0.94
TL–ROGWe	495	1×10^{-29}	11.196	0.371	0.65	TL–LCLB	1.105	0.0001	1.733	0.022	0.85
TL–LUL	478	0.0001	2.271	0.071	0.68	TL–LL	1.042	0.0101	1.531	0.014	0.92
TL–LUWi	568	2×10^{-13}	5.175	0.224	0.49	TL–LWe	1.042	2×10^{-9}	3.743	0.027	0.95
TL–LUWe	431	1×10^{-22}	8.459	0.515	0.39						
TL–RUL	478	0.0001	2.215	0.070	0.68						
TL–RUWi	568	3×10^{-13}	5.116	0.223	0.48						
TL–RUWe	431	1×10^{-22}	8.437	0.514	0.39						
TL–LL	996	0.0044	1.691	0.015	0.92						
TL–LWe	994	4×10^{-10}	4.058	0.034	0.93						

Table S4. Descriptive statistics of the paired reproductive organs' measurements (mm) of female and male *Scyliorhinus canicula*

P_W corresponds to the *P*-values of the Wilcoxon–Mann–Whitney test after the pairwise comparison of all measurements; *n*, number of individuals; s.d., standard deviation; *, statistically significant value; The symbols are explained in Tables S1 and S2

Symbol	*n*	Mean	s.d.	Range	Symbol	*n*	Mean	s.d.	Range	P_W
LOGL	602	19.8	5.60	4.00–45.0	ROGL	495	19.7	5.66	4.00–44.0	0.6849 (W=146880)
LOGWi	602	12.0	4.82	2.00–29.0	ROGWi	495	11.8	5.02	2.00–27.0	0.6779 (W=146831)
LOGWe	602	1.32	1.07	0.004–4.8	ROGWe	495	1.30	1.09	0.003–5.1	0.6556 (W=146668)
LUL	478	79.5	20.4	35.0–129	RUL	478	80.0	19.9	37.0–130	0.6659 (W=116085)
LUWi	568	7.42	5.13	0.50–21.0	RUWi	568	7.43	5.16	0.50–22.0	0.9951 (W=161346)
LUWe	431	1.40	1.35	0.04–5.50	RUWe	431	1.42	1.36	0.04–5.46	0.8519 (W=93564)
LTL	734	66.9	21.4	8.00–125	RTL	734	83.3	21.9	18.0–145	*0 (W=378424)
LTWi	614	10.8	4.78	1.00–20.0	RTWi	614	10.0	4.40	1.00–23.0	*0 (W=164913)
LTWe	825	2.89	2.11	0.00–9.80	RTWe	825	3.13	2.32	0.00–11.1	0.0992 (W=356269)