SUPPORTING INFORMATION

GLOSSARY OF INDEPENDENT MODEL PARAMETERS

Habitat type

Bathydemersal: Species living and feeding on the bottom below 200m.

Bathypelagic: Species living or feeding in open waters at depths between 1,000 and 4,000m.

Benthopelagic: Living and feeding near the bottom as well as in midwaters or near the surface.

Demersal: Living on or near the bottom and feeding on benthic organisms.

Pelagic: Living and feeding in the open sea from 0 – 200m.

Reef: Living and feeding on or near coral reefs

Reproductive mode

Dioecism: Individuals are sexually distinctive and there is no sex-switching.

Protandry: Sequential hermaphroditism in which an individual transforms from male to female.

Protogyny: Sequential hermaphroditism in which an individual transforms from female to male.

Reproductive guild

Oviparous brooders: Species that lay and incubate eggs externally on parental body, e.g., pouch, mouth, gill cavities, pelvic fins.

Oviparous guarders: Species that deposit and guard their eggs either at the surface, the underside of objects or in purpose-built nests.

Oviparous non-guarders: Species that lay eggs unguarded in the water column or on any substrate.

Viviparous: Species that fertilize eggs internally and give birth to live young.

Table S1. Phylogenetically-corrected mean Sexual Dimorphic Index (SDI) values for fish, where data are divided by taxonomic classification, environment, habitat and reproductive characteristics. Phylogenetic reduced-major-axis (RMA) regressions of $\log_{10}$ male versus $\log_{10}$ female length-at-maturity generate β, the slope estimate; *a,* the intercept; and r^2 the correlation coefficient. In each case, p-values indicate whether the mean SDI differs significantly from zero, and if *β* differs significantly from 1. Significant differences ($p<0.05$) are highlighted in bold. Where sexual size dimorphism is evident, the larger sex is given in brackets (i.e. ♀ or ♂) next to the relevant taxon. These analyses were only performed when $n\geq5$. See accompanying Figure 2 in the main text.

Taxa	*n*	SDI	*p (SDI ≠ 0)*	*B*	*a*	r^2	*p (β ≠ 1)*
All fish	619	0.076	0.45	0.97	0.038	0.95	**<0.001**
Class							
Actinopterygii	543	0.047	0.61	0.968	0.062	0.95	**<0.01**
Elasmobranchii (♀)	68	0.134	**<0.01**	0.990	-0.079	0.97	0.64
Order							
Acipenseriformes	6	0.040	0.62	1.011	-0.110	0.97	0.90
Atheriniformes	5	0.028	0.74	1.107	-0.296	0.90	0.61
Beloniformes	5	0.012	0.60	1.105	-0.370	0.98	0.23
Carcharhiniformes (♀)	30	0.086	**<0.001**	0.976	0.025	0.98	0.35
Characiformes (♀)	35	0.117	**0.03**	0.922	0.093	0.97	**<0.01**
Clupeiformes	24	0.072	0.09	0.915	0.169	0.97	**0.02**
Cypriniformes (♀)	29	0.168	**<0.001**	0.983	-0.097	0.98	0.51
Gadiformes (♀)	22	0.105	**0.04**	0.903	0.252	0.92	0.13
Mugiliformes	14	0.109	0.43	1.040	-0.204	0.83	0.75
Osmeriformes (♀)	7	0.158	**<0.001**	0.996	-0.098	0.98	0.94
Osteoglossiformes	5	-0.129	0.16	1.000	0.111	0.95	1.00
Perciformes	243	0.038	0.75	0.993	-0.018	0.93	0.70
Pleuronectiformes (♀)	30	0.189	**<0.001**	0.902	0.175	0.92	0.07
Rajiformes	14	0.095	0.07	1.013	-0.142	0.95	0.83
Salmoniformes	5	-0.005	0.40	1.014	-0.125	0.92	0.94
Scorpaeniformes	52	0.073	0.053	0.930	0.168	0.91	0.10
Siluriformes (♀)	29	0.009	**<0.01**	0.860	0.406	0.93	**<0.01**
Squaliformes (♀)	13	0.237	**<0.001**	1.033	-0.367	0.98	0.45
Family							
Acipenseridae	6	0.040	0.62	1.011	-0.116	0.97	0.90
Anostomidae (♀)	7	0.201	**<0.001**	1.034	-0.281	0.92	0.80
Carangidae	18	0.076	0.31	0.951	0.103	0.93	0.46
Carcharhinidae (♀)	17	0.051	**<0.01**	0.979	0.054	0.99	0.46
Characidae (♂)	8	-0.094	**<0.001**	0.923	0.200	0.98	0.22
Cichlidae	29	-0.082	0.19	0.926	0.260	0.93	0.15
Clupeidae (♀)	18	0.108	**0.02**	0.924	0.122	0.97	0.10

Cyprinidae (♀)	26	0.172	**<0.001**	0.972	-0.057	0.98	0.32
Gadidae (♀)	9	0.065	**<0.001**	0.978	0.015	0.93	0.83
Gerreidae (♀)	7	0.282	**0.03**	0.826	0.292	0.65	0.50
Gobiidae (♀)	7	0.027	**<0.001**	1.049	-0.104	0.98	0.46
Haemulidae	9	0.009	0.27	0.892	0.300	0.98	0.09
Labridae	5	-0.742	0.07	1.123	0.227	0.87	0.60
Lethrinidae	6	0.194	0.37	0.990	-0.037	0.57	0.98
Lutjanidae	13	-0.003	0.98	1.049	-0.215	0.97	0.42
Merlucciidae (♀)	5	0.229	**0.048**	0.716	0.806	0.91	0.12
Mormyridae	5	-0.129	0.16	1.000	0.111	0.95	1.00
Mugilidae	14	0.109	0.43	1.040	-0.204	0.83	0.75
Mullidae	8	0.027	0.38	1.105	-0.319	0.97	0.23
Nototheniidae	5	0.186	0.052	1.084	-0.490	0.99	0.20
Pimelodidae	6	0.111	0.113	0.836	0.423	0.97	0.08
Pleuronectidae (♀)	15	0.218	**<0.001**	0.883	0.249	0.92	0.13
Rajidae (♀)	10	0.094	**<0.01**	0.917	0.276	0.94	0.35
Salmonidae	5	-0.005	0.40	1.014	-0.125	0.92	0.94
Sciaenidae (♀)	22	0.103	**<0.001**	0.912	0.182	0.95	0.09
Scombridae (♂)	12	-0.006	**<0.001**	1.000	0.014	0.98	0.98
Scyliorhinidae (♀)	5	0.095	**<0.001**	0.912	0.238	0.95	0.52
Sebastidae (♀)	41	0.097	**0.02**	0.958	0.067	0.81	0.55
Serranidae	15	-0.032	0.83	1.009	-0.056	0.65	0.96
Sillaginidae	8	0.073	0.18	0.943	0.125	0.98	0.39
Sparidae	25	-0.006	0.91	1.081	-0.247	0.89	0.28
Squalidae (♀)	6	0.271	**<0.001**	0.998	-0.230	0.96	0.98
Triakidae	7	0.104	0.60	1.344	-1.721	0.83	0.17
Triglidae	6	0.110	0.36	1.269	-0.905	0.78	0.36
Environment							
Freshwater	164	0.027	0.70	0.955	0.110	0.97	**<0.01**
Marine	455	0.091	0.30	0.973	0.017	0.93	**0.03**
Habitat							
Bathydemersal (♀)	31	0.153	**<0.001**	0.909	0.198	0.91	0.10
Bathypelagic	7	0.220	0.09	1.021	-0.266	0.99	0.70
Benthopelagic	143	0.098	0.10	0.981	-0.023	0.97	0.19
Demersal	243	0.063	0.47	0.948	0.126	0.94	**<0.001**
Pelagic (♀)	69	0.087	**<0.01**	0.929	0.175	0.97	**<0.01**
Reef	126	0.022	0.45	1.001	-0.057	0.91	0.97
Reproductive Mode							
Dioecism	469	0.085	0.23	0.967	0.047	0.96	**<0.001**
Protandry (i.e. male → female) (♀)	7	0.126	**0.04**	1.064	-0.325	0.94	0.60
Protogyny (i.e. female → male) (♂)	28	-0.158	**<0.001**	1.133	1.000	0.87	0.43
Fertilization Method							
External	382	0.079	0.43	0.967	0.046	0.95	**<0.01**
Internal (♀)	118	0.103	**<0.001**	0.981	-0.025	0.94	0.42
Reproductive Guild							

Oviparous (brooder) (♂)	22	-0.110	**<0.001**	0.904	0.362	0.91	0.14
Oviparous (guarder)	39	0.004	0.98	0.998	-0.001	0.96	0.96
Oviparous (non-guarder) (♀)	326	0.089	**0.01**	0.979	-0.007	0.95	0.08
Viviparous	89	0.106	0.77	0.981	0.007	0.94	0.47
Parental Care							
None (♀)	325	0.091	**<0.01**	0.980	-0.014	0.95	0.11
Biparental	7	-0.086	0.16	0.924	0.291	0.98	0.20
Maternal	24	0.076	0.89	1.011	-0.098	0.93	0.84
Paternal (♂)	18	-0.115	**<0.001**	0.911	0.284	0.94	0.14

Table S2. AIC output comparing the top candidate models (i.e. where ΔAICc is <2) that explain variation in the sexual dimorphism index (SDI) in fish, after accounting for the phylogenetic correlation among observations.

	Model Parameters					Summary Statistics				
Model ID	**Habitat Type**	**Reproductive Mode**	**Reproductive Guild**	**Fertilization Method**	**Parental Care**	**K**	**Log-Likelihood**	**AICc**	**ΔAICc**	**w_i**
1	+	+	+			13	70.85	-172.03	0.00	0.70
2	+	+		+	+	14	65.79	-170.31	1.72	0.30
Importance	**1.00**	**1.00**	**0.70**	**0.30**	**0.30**					

Notes: The parameters included in each model are indicated with a plus sign (+). Akaike weight (w_i) denotes the probability of a given model being the best fit model in the candidate set. The number of parameters (K) in each model is shown. The best model is identified as that with the lowest small-samples corrected AIC (AICc). Alternative models are shown where the difference between the lowest AICc and those of the alternative models (i.e. ΔAICc) is <2. This best set of models was used to calculate the relative importance of each parameter (computed for each variable as the sum of w_i from all models in which they appear).

Table S3. 'Full' model-averaged coefficients for each of the fixed variables included in our top set of candidate models (see Table S2). Confidence intervals, z-values and p-values are also shown. Significant effects (p<0.05) are highlighted in bold.

Model Parameter	**Full model-averaged coefficient**	**Lower CI (2.5%)**	**Upper CI (97.5%)**	**z-value**	**p**
Intercept	0.07	-0.12	0.25	0.71	0.48
Reproductive guild (oviparous guarders)	0.02	-0.09	0.13	0.38	0.70
Reproductive guild (viviparous)	0.22	-0.09	0.53	1.41	0.16
Reproductive guild (oviparous non-guarders)	0.13	-0.06	0.33	1.38	0.17
Habitat type (bathypelagic)	-0.12	-0.35	0.12	0.97	0.33
Habitat type (benthopelagic)	-0.17	-0.32	-0.02	2.20	**0.03**
Habitat type (demersal)	-0.14	-0.28	0.01	1.84	0.07
Habitat type (pelagic)	-0.17	-0.32	-0.01	2.06	**0.04**
Habitat (reef)	-0.22	-0.37	-0.07	2.84	**<0.01**
Reproductive mode (protandry)	0.03	-0.12	0.18	0.36	0.72
Reproductive mode (protogyny)	-0.22	-0.30	-0.14	5.18	**<0.001**
Fertilization method (internal)	0.01	-0.04	0.07	0.53	0.60
Parental care (maternal)	0.04	-0.12	0.20	0.53	0.60
Parental care (none)	0.05	-0.12	0.22	0.58	0.56
Parental care (paternal)	-0.004	-0.09	0.08	0.10	0.92

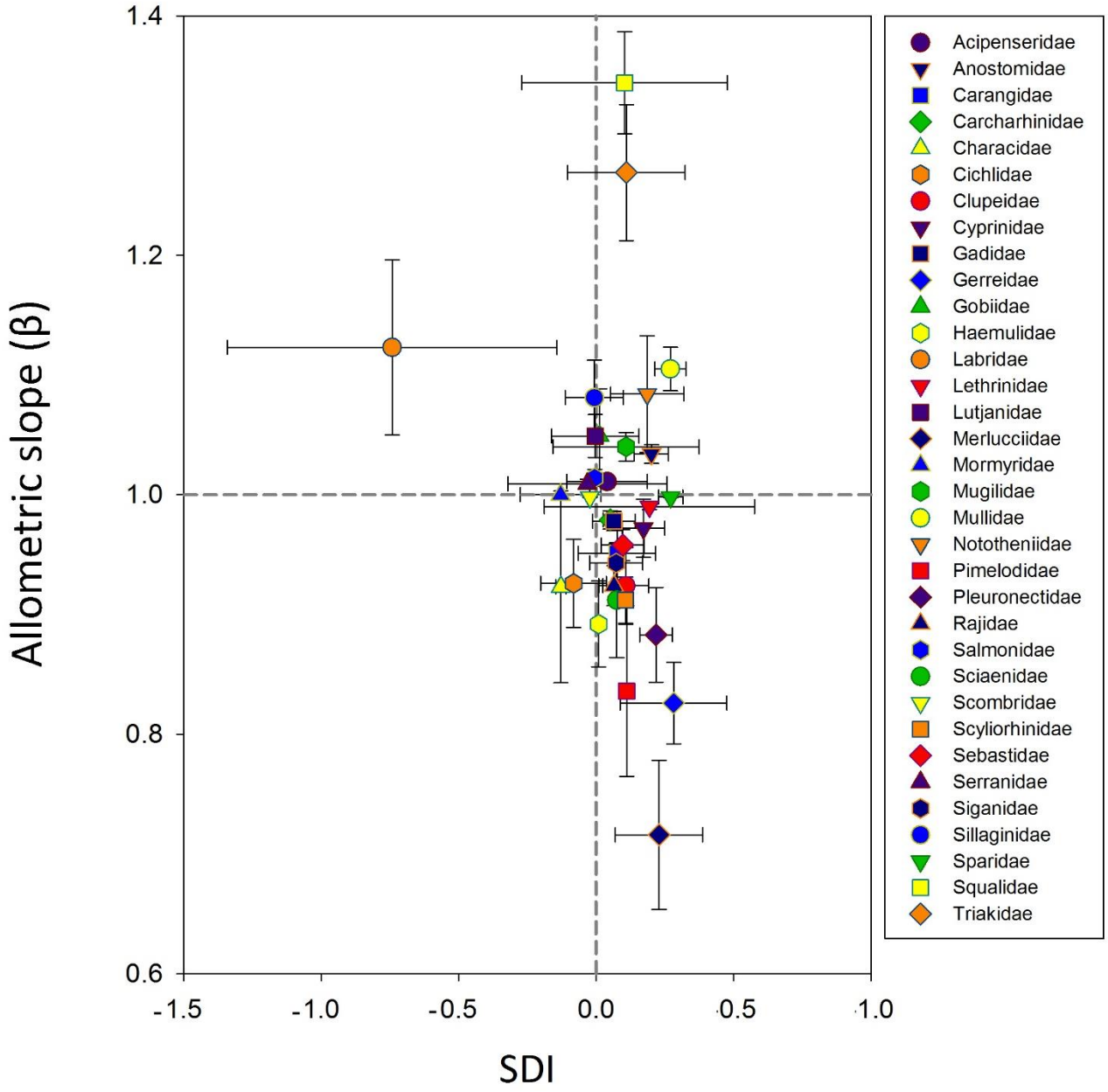

Figure S1. Family-specific allometric slopes versus SDI.

Allometric slope (β) values were derived from phylogenetic reduced major axis (RMA) regressions of $\log_{10}$ male versus $\log_{10}$ female length-at-maturity. β values >1 indicate greater divergence in male body size, whereas slope values <1 indicate greater divergence in female body size. Sexual Dimorphic Index (SDI) values are positive when females are the larger sex, and negative when males are larger. Error bars denote 95% confidence intervals. We find no significant relationship between these two metrics at the family level.

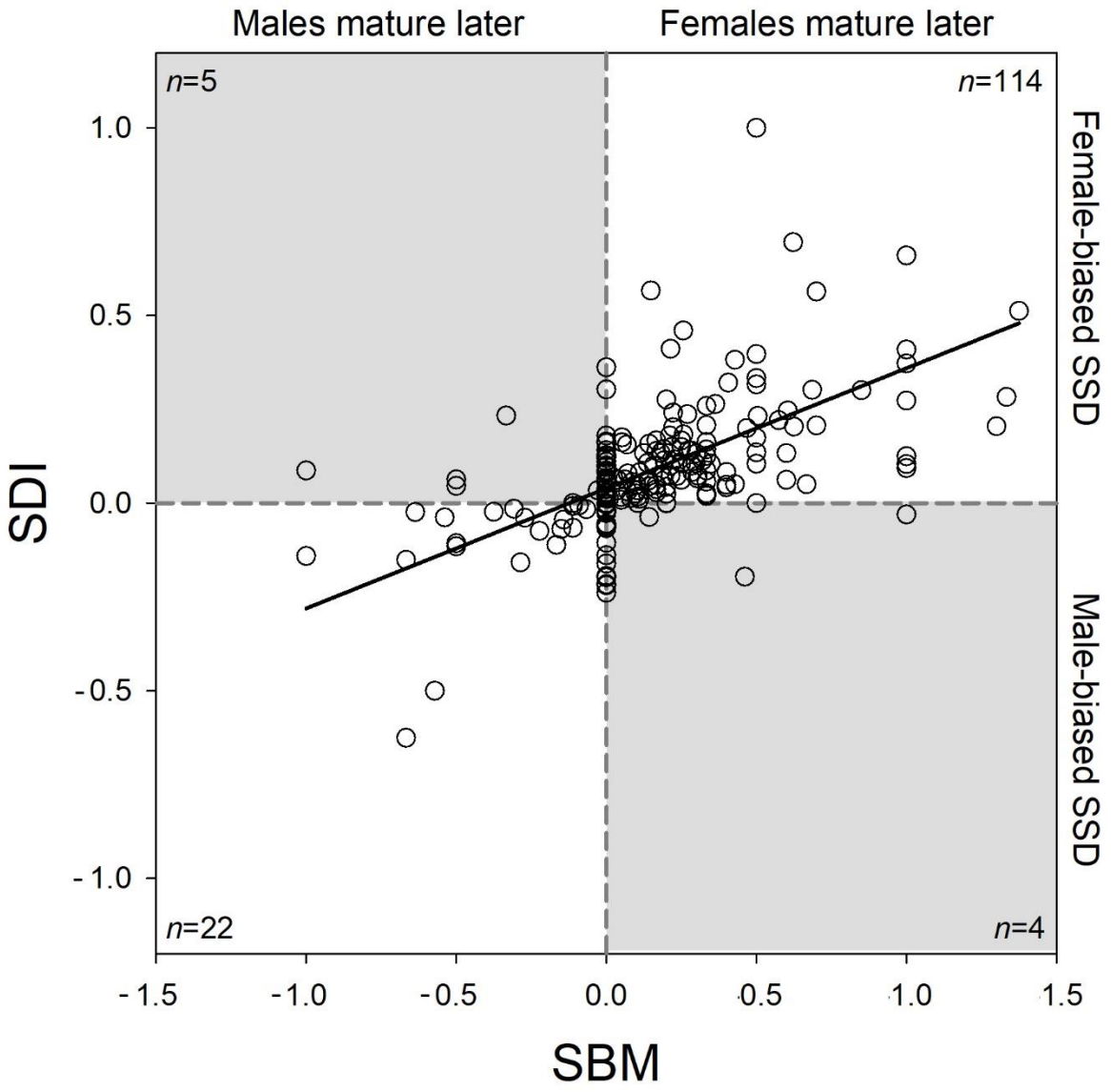

Figure S2. Co-variation between SSD and relative differences in age at maturity of the sexes. Species-specific Sexual Dimorphic Index (SDI) versus the sexual bimaturism index (SBM) for fish. SDI values are positive when females are the larger sex and negative when males are larger. SBM is positive when females mature later and negative when males mature later. The number of data points (*n*) falling within each of the four quadrants is indicated, and the majority of species fall within the unshaded quadrants, indicating that SDI and SBM positively co-vary, i.e. the larger sex also reaches maturity later. The solid line shows the phylogenetic generalized least squares regression through the data, which is significant. Consequently, those species with the greatest relative difference in age at maturity between the sexes also tend to exhibit the strongest degree of SSD.