

Supplement

Table S1. Functional groups and key species in the model of the Yellow River Estuary ecoregion.

No.	Functional group	Species
1	<i>Scomberomorus niphonius</i>	<i>Scomberomorus niphonius</i>
2	Pelagic omnivore fish	<i>Auxis rochei</i> , <i>Scomber japonicus</i>
3	Carnivorous sharks	<i>Sphyrna zygaena</i> , <i>Alopias vulpinus</i> , <i>Mustelus manazo</i>
4	Pelagic planktivorous fish	<i>Konosirus punctatus</i> , <i>Ilisha elongata</i> , <i>Sardinops sagax</i> , <i>Clupea pallasii</i> , <i>Trachurus japonicus</i> , <i>Engraulis japonicus</i> , <i>Thryssa kammalensis</i> , <i>Setipinna taty</i> , <i>Ammodytes personatus</i>
5	Filter-feeding sharks	<i>Cetorhinus maximus</i>
6	Demersal nekton-feeding fish	<i>Cynoglossus joyneri</i> , <i>Trichiurus lepturus</i> , <i>Thunnus albacares</i> , <i>Lateolabrax japonicus</i> , <i>Platycephalus indicus</i> , <i>Acanthopagrus schlegelii</i>
7	Demersal omnivorous fish	<i>Gadus macrocephalus</i> , <i>Theragra chalcogramma</i> , <i>Conger conger</i> , <i>Pleurogrammus azonus</i> , <i>Netuma thalassina</i> , <i>Argyrosomus argentatus</i> , <i>Platichthys stellatus</i>
8	Demersal benthos-feeding fish	<i>Cynoglossus semilaevis</i> , <i>Takifugu vermicularis</i> , <i>Sebastes schlegelii</i> , <i>Pseudopleuronectes herzensteini</i> , <i>Diplogrammus goramensis</i> , <i>Johnius belangerii</i> , <i>Sillago sihama</i>
9	Gobies	<i>Synechogobius ommaturus</i> , <i>Acanthogobius ommaturus</i> , <i>Odontamblyopus rubicundus</i> , <i>Synechogobius hasta</i> , <i>Chaeturichthys stigmatias</i> , <i>Tridentiger trigonocephalus</i> , <i>Ctenotrypauchen microcephalus</i> (Bleeker)
10	Cephalopods	<i>Octopus ocellatus</i> , <i>Octopus variabilis</i> , <i>Sepiola birostrata</i> , <i>Todarodes pacificus</i>
11	<i>Alpheus</i>	<i>Alpheus japonicus</i> , <i>Alpheus distinguendus</i>
12	<i>Oratosquilla oratoria</i>	<i>Oratosquilla oratoria</i>
13	Shrimps	<i>Fenneropenaeus chinensis</i> , <i>Marsupenaeus japonicus</i> , <i>Metapenaeus joyneri</i> , <i>Penaeidae</i> sp., <i>Leptochela gracilis</i> Stimpson, <i>Latreutes anoplonyx</i> , <i>Ogyrides orientalis</i> (Stimpson), <i>Exopalaemon carinicauda</i> , <i>Trachysalambria curvirostris</i> , <i>Nihonotrypaea japonica</i> (Ortmann)
14	Crabs	<i>Portunus trituberculatus</i> , <i>Philyra acutidens</i> , <i>Typhlocarcinops canaliculata</i> Rathbun, <i>Pyrhila pisum</i> , <i>Matuta planipes</i> , <i>Eucrata crenata</i> de Haan, <i>Dorippe japonica</i> , <i>Charybdis japonica</i>
15	Gastropods	<i>Neverita didyma</i> (Roding), <i>Neverita ampla</i> (Philippi), <i>Nassarius succinctus</i> (A. adams), <i>Nassarius variciferus</i> (A. Adams), <i>Rapana venosa</i> , <i>Thais clavigera</i> , <i>Bullacta exarata</i> (Philippi, 1848), <i>Nassarius semiplicatus</i> , <i>Ringicula (Ringiculina) doliaris</i> Gould, <i>Decorifera matusimana</i> (Nomura)
16	Wild Bivalves	<i>Crassostrea gigas</i> , <i>Scapharca subcrenata</i> (Lischke), <i>Perna viridis</i> , <i>Solen grandis</i> Dunker, <i>Mactra sachalinensis</i> , <i>Meretrix lusoria</i> , <i>Nucula nipponica</i> , <i>Felaniella usta</i> , <i>Yoldia similis</i> Kuroda et Habe, <i>Moerella iridescens</i> (Benson), <i>Theora fragilis</i> (A. Adams), <i>Endopleura lubrica</i> , <i>Mya arenaria</i> Linnaeus

17	Cultured Bivalves	Oysters, Scallops, Clams, Mussels
18	Echinoderms	<i>Echinocardium cordatum</i> , <i>Protankyra bidentata</i> (Woodward et Barrett), <i>Amphioplus japonicus</i> Matsumoto., <i>Luidia quinaria</i>
19	Carnivorous polychaetes	<i>Aglaophamus sinensis</i> , <i>Anaitides papillosa</i> Uschakov et Wu, <i>Glycera chirori</i> Izuka, <i>Glycinde gurjanovae</i> Uschakov et Wu, <i>Goniada japonica</i> Izuka, <i>Lumbrineris longifolia</i> , <i>Lumbrineris cruzensis</i> Hartman, <i>Nephtys caeca</i> (Fabricius), <i>Nephtys oligobranchia</i> Southern, <i>Ophiodromus angustifrons</i> (Grube), <i>Paralacydonia paradoxa</i> Fauvel, <i>Sthenolepis japonica</i> (McIntosh)
20	Other polychaetes	<i>Ancistrosyllis hanaokai</i> Kitamori, <i>Spio martinensis</i> , <i>Sabellidae</i> sp., <i>Amaeana occidentalis</i> (Hartman), <i>Aricidea fragilis</i> Webster, <i>Cirriformia tentaculata</i> , <i>Euclymene lombricoides</i> (Quatrefages), <i>Heteromastus filiformis</i> (Claparede), <i>Laonice cirrata</i> (Sars), <i>Linopherus ambigua</i> (Monro), <i>Notomastus latericeus</i> Sars, <i>Paramphicteis angustifolia</i> , <i>Paraprionospio pinnata</i> (Ehlers), <i>Pherusa cf. bengalensis</i> (Fauvel), <i>Pista cristata</i> (Müller), <i>Poecilochaetus serpens</i> , <i>Scoloplos rubra</i> , <i>Sternaspis sculata</i> (Renier), <i>Terebellides stroemii</i> , <i>Tharyx multifilis</i> Moore
21	Other zoobenthos	<i>Eriopisella sechellensis</i> (Chevreux), <i>Ampelisca brevicornis</i> (Costa), <i>Ampelisca bocki</i> , <i>Ampelisca cyclops</i> Walker, <i>Oedicerotidae</i> sp., <i>Ampithoe volida</i> Smith, <i>Iphinoe tenera</i> Lomakina, <i>Eocuma lata calman</i> , <i>Paranthura japonica</i> , <i>Cirolana japonensis</i> Richardson, <i>Corophium acherusicum</i> , <i>Paranthura japonica</i> Richardson
22	Zooplankton	–
23	Phytoplankton	–
24	Detritus	–

Table S2. Ecopath Pedigree index for the model. Higher numbers denote greater confidence of the value of each parameter in each functional group. The mark “-” means not applicable.

No.	Group	B	P/B	Q/B	Diet	Catch
1	<i>Scomberomorus niphonius</i>	6	7	7	6	1
2	Pelagic omnivore fish	6	5	5	5	4
3	Carnivorous sharks	6	3	3	5	–
4	Pelagic planktivorous fish	6	7	7	5	1
5	Filter-feeding sharks	6	3	3	4	–
6	Demersal nekton-feeding fish	6	7	7	5	–
7	Demersal omnivorous fish	6	7	7	4	–
8	Demersal benthos-feeding fish	6	7	7	5	–
9	Gobies	6	7	7	6	–
10	Cephalopods	6	7	7	5	–
11	<i>Alpheus</i>	6	7	7	5	–
12	<i>Oratosquilla oratoria</i>	6	7	7	5	4
13	Shrimps	6	7	7	5	4
14	Crabs	6	3	3	5	4
15	Gastropods	6	7	7	5	–
16	Wild Bivalves	6	7	7	5	4
17	Cultured Bivalves	–	–	–	–	–
18	Echinoderms	6	7	7	5	–
19	Carnivorous polychaetes	6	3	3	4	–
20	Other polychaetes	6	3	3	4	–
21	Other zoobenthos	6	7	7	5	–
22	Zooplankton	6	7	7	5	4
23	Phytoplankton	6	7	–	–	–
24	Detritus	2	–	–	–	–

Ecopath Pedigree Index: 0.758

Number of living groups: 24

Measure of fit: 5.319

Table S3. Information analysis of balanced model outputs. Ascendency is a measure of the average mutual information in a system, scaled by system throughput, and is derived from information theory (Ulanowicz and Norden, 1990). Overhead provides limits on how much the ascendency can increase and reflect the system's ‘strength in reserve’ from which it can draw to meet unexpected perturbations (Ulanowicz, 1986). Overhead is the difference between the capacity and the ascendency.

No.	Group	Ascendency ([t km ⁻² year ⁻¹] *bits)	Overhead ([t km ⁻² year ⁻¹] *bits)	Capacity ([t km ⁻² year ⁻¹] *bits)	Info. (bits)	Throughput (t km ⁻² year ⁻¹)
1	<i>Scomberomorus niphonius</i>	0.006	0.177	0.183	1.0E-06	0.009
2	Pelagic omnivore fish	0.081	0.460	0.541	1.3E-05	0.029
3	Carnivorous sharks	6.0E-06	1.1E-04	1.1E-04	0.000	4.0E-06
4	Pelagic planktivorous fish	5.3	24.0	29.3	8.5E-04	2.3
5	Filter-feeding sharks	8.3E-05	1.2E-03	1.3E-03	0.000	4.5E-05
6	Demersal nekton-feeding fish	2.8	14.6	17.5	4.6E-04	1.3
7	Demersal omnivorous fish	0.187	2.0	2.1	3.0E-05	0.13
8	Demersal benthos-feeding fish	0.563	2.5	3.0	9.1E-05	0.181
9	Gobies	3.6	17.8	21.4	5.8E-04	1.6
10	Cephalopods	0.355	3.6	3.9	5.7E-05	0.247
11	<i>Alpheus</i>	0.628	2.6	3.2	1.0E-04	0.195
12	<i>Oratosquilla oratoria</i>	5.0	44.6	49.6	8.1E-04	4.2
13	Shrimps	61.3	218.5	279.9	0.010	28.6
14	Crabs	29.6	149.0	178.6	0.005	17.1
15	Gastropods	20.7	87.1	107.7	0.003	9.8
16	Wild Bivalves	34.6	197.6	232.1	0.006	22.6
17	Cultured Bivalves	186.0	1323.0	1509	0.030	244.0
18	Echinoderms	95.4	238.9	334.3	0.015	35.2
19	Carnivorous polychaetes	15.9	70.7	86.6	0.003	7.5
20	Other polychaetes	18.2	75.2	93.4	0.003	8.2
21	Other zoobenthos	21.3	90.2	111.4	0.003	9.9
22	Zooplankton	1544	3399	4943	0.249	1363

23	Phytoplankton	1959	4286	6245	0.315	2447
24	Detritus	2437	3213	5650	0.392	1988
	Import					20
	Total	6441	13461	19902	1.0	6210
	Percentage of total (%)	32.36	67.64	100		

Literature cited

- Ulanowicz RE, Norden JS (1990) Symmetrical overhead in flow networks. *International Journal of Systems Science* 21:429-437
- Ulanowicz RE (1986) *Growth and Development Ecosystems Phenomenology*. Springer-Verlag, NY. 203p.