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Supplementary material

Feeding ecology of juvenile Pacific bluefin tuna *Thunnus orientalis* in the Sea of Japan

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Table S1. Equations for size–mass and dry mass–wet mass relationships used for estimating the wet mass of zooplankton from size data

DM, dry mass (μg); WM_1, wet mass (μg); WM_2, wet mass (mg); PL, prosome length (μm); TL, total length (mm)

Category	Equation	Reference
Candaciidae spp.	$\ln DM = 3.38 \ln PL - 20.48$	Webber and Roff (1995)
Centropages tenuiremis	$\log_{10} DM = 3.00 \log_{10} PL - 7.89$	Uye (1982)
Labidocera acuta	$DM = 3.770 \times 10^{-8} PL^{2.637}$	Ara (2001)
Nanocalanus minor	$\ln DM = 2.73 \ln PL - 15.93$	Webber and Roff (1995)
Paracalanus parvus	$\ln DM = 2.78 \ln PL - 16.52$	Webber and Roff (1995)
Paraeuchaeta russeli	$\ln DM = 3.00 \ln PL - 17.82$	Webber and Roff (1995)
Subeucalanus subcrassus	$\log_{10} WM_1 = 2.8628 \log_{10} TL - 1.6010$	Cass (2011)
Temora discaudata	$\ln DM = 3.55 \ln PL - 21.38$	Satapoomin (1999)
Calanoida spp.	$\ln DM = 2.73 \ln PL - 15.93$	Webber and Roff (1995)
Euterpina acutifrons	$DM = 8.148 \times 10^{-8} PL^{2.736}$	Ara (2001)
Corycaeus spp.	$\ln DM = 1.70 \ln PL - 9.92$	Chisholm and Roff (1990)
Farranula spp.	$\ln DM = 2.72 \ln PL - 16.19$	Webber and Roff (1995)
Oncaea spp.	$\ln DM = 2.10 \ln PL - 11.63$	Webber and Roff (1995)
Sapphirinidae spp.	$\log_{10} DM = 1.142 \log_{10} TL + 0.802$	Lopes *et al*. (2007)
Primno abyssallis	$WM_2 = 23.99 TL^{2.97} \times 10^{-3}$	Ikeda (1995)
Themisto japonica	$\log_{10} WM_2 = 2.832 \log_{10} TL - 1.517$	Ikeda (1990)
Euphausiidae spp.	$\log_{10} WM_2 = 3.31 \log_{10} TL - 2.58$	Iguchi *et al*. (1993)
All zooplankton	$WM_2 = DM/0.19$	Omori (1969)

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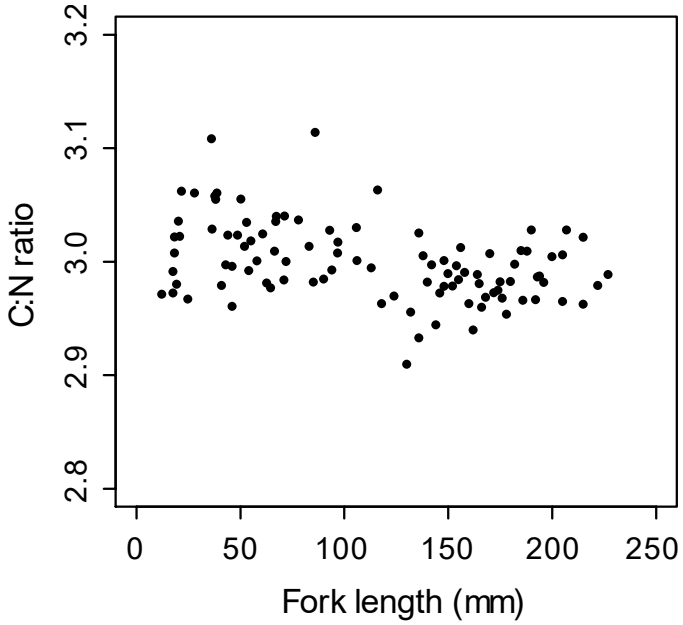

Figure S1. Relationships between the C:N ratio and fork length of Pacific bluefin tuna *Thunnus orientalis*

Table S2. The prey-specific numerical percentage composition (%PN) and prey-specific percentage mass composition (%PM) of stomach contents of juvenile *Thunnus orientalis*

Data are presented for 2 categories of fork length (FL), with the numbers of stomachs with prey items (n_p)

Prey category	FL < 100 mm (n_p = 23)		FL ≥ 100 mm (n_p = 49)		Total (n_p = 72)	
	%*PN*	%*PM*	%*PN*	%*PM*	%*PN*	%*PM*
(Crustacea)						
Candacia bipinnata	-	-	12.00	17.59	12.00	17.59
Candacia catula	-	-	1.92	0.03	1.92	0.03
Candacia sp.	-	-	2.95	0.07	2.95	0.07
Candaciidae sp.	-	-	3.68	<0.01	3.68	<0.01
Centropages tenuiremis	-	-	8.33	5.54	8.33	5.54
Labidocera acuta	-	-	1.59	0.04	1.59	0.04
Nannocalanus minor	-	-	0.79	0.08	0.79	0.08
Paracalanus parvus	-	-	1.79	0.01	1.79	0.01
Paraeuchaeta russelli	-	-	3.85	2.41	3.85	2.41
Subeucalanus subcrassus	-	-	1.53	0.18	1.53	0.18
Temora discaudata	-	-	8.52	16.93	8.52	16.93
Calanoida spp.	-	-	6.11	1.55	6.11	1.55
Euterpina acutifrons	-	-	3.13	0.03	3.13	0.03
Corycaeus (Agetus) flaccus	50.00	0.31	-	-	50.00	0.31
Corycaeus (Agetus) typicus	12.50	0.05	1.59	0.01	7.04	0.03
Corycaeus (Onychocorycaeus) agilis	-	-	0.89	0.01	0.89	0.01
Corycaeus (Onychocorycaeus) catus	-	-	1.11	<0.01	1.11	<0.01
Corycaeus (Onychocorycaeus) pacificus	-	-	2.57	0.04	2.57	0.04
Corycaeus speciosus	-	-	1.68	0.04	1.68	0.04
Corycaeus sp.	-	-	10.00	0.05	10.00	0.05
Farranula carinata	-	-	2.22	0.01	2.22	0.01
Farranula rostrata	-	-	0.79	<0.01	0.79	<0.01
Oncaea clevei	-	-	1.11	0.01	1.11	0.01
Oncaea dentipes	-	-	1.11	<0.01	1.11	<0.01
Oncaea media	12.50	0.08	9.17	0.42	9.45	0.39
Oncaea mediterranea	-	-	23.23	12.79	23.23	12.79

Prey category	FL < 100 mm (n_p = 23)		FL ≥ 100 mm (n_p = 49)		Total (n_p = 72)	
	%*PN*	%*PM*	%*PN*	%*PM*	%*PN*	%*PM*
Oncaea scottodicarloi	-	-	6.28	0.03	6.28	0.03
Oncaea venusta	12.50	0.21	11.44	0.59	11.53	0.56
Oncaea sp.	-	-	3.76	0.08	3.76	0.08
Copilia sp.	-	-	5.77	<0.01	5.77	<0.01
Sapphirina sp.	-	-	1.36	<0.01	1.36	<0.01
Copepoda spp.	-	-	59.57	3.94	59.57	3.94
Squillidae spp.	-	-	4.53	23.92	4.53	23.92
Primno abyssalis	-	-	1.68	3.47	1.68	3.47
Themisto japonica	-	-	3.54	16.54	3.54	16.54
Hyperiidae spp.	-	-	4.90	31.02	4.90	31.02
Euphausiidae sp.	-	-	6.23	0.61	6.23	0.61
Caridea sp.	-	-	3.85	<0.01	3.85	<0.01
Porcellanidae sp.	-	-	0.89	0.94	0.89	0.94
Brachyura spp.	-	-	11.61	7.70	11.61	7.70
Decapoda spp.	-	-	21.00	20.51	21.00	20.51
Crustacea spp.	-	-	2.80	22.94	2.80	22.94
(Cephalopoda)						
Teuthida sp.	-	-	15.40	1.35	15.40	1.35
Enoploteuthis chunii	37.50	20.80	54.04	27.46	52.94	27.01
Watasenia scintillans	-	-	37.44	2.47	37.44	2.47
Todarodes pacificus	-	-	50.81	51.10	50.81	51.10
(Pisces: Teleostei)						
Sardinops melanostictus	-	-	100.00	100.00	100.00	100.00
Engraulis japonicus	71.67	67.77	50.32	55.94	60.02	61.32
Maurolicus japonicus	65.00	29.91	31.40	49.13	50.07	38.46
Trachurus japonicus	-	-	22.45	78.32	22.45	78.32
Auxis sp.	100.00	100.00	2.63	7.23	51.32	53.61
Thunnus sp.	75.00	93.00	-	-	75.00	93.00
Teleostei spp.	60.65	85.83	8.00	15.96	31.69	49.06
(others)						
Limacina sp.	-	-	1.23	0.72	1.23	0.72
Halobates sp.	-	-	0.79	<0.01	0.79	<0.01
Oribatida sp.	-	-	2.08	<0.01	2.08	<0.01
Unknown egg	-	-	29.17	<0.01	29.17	<0.01
Plastic debris	-	-	19.20	60.06	19.20	60.06

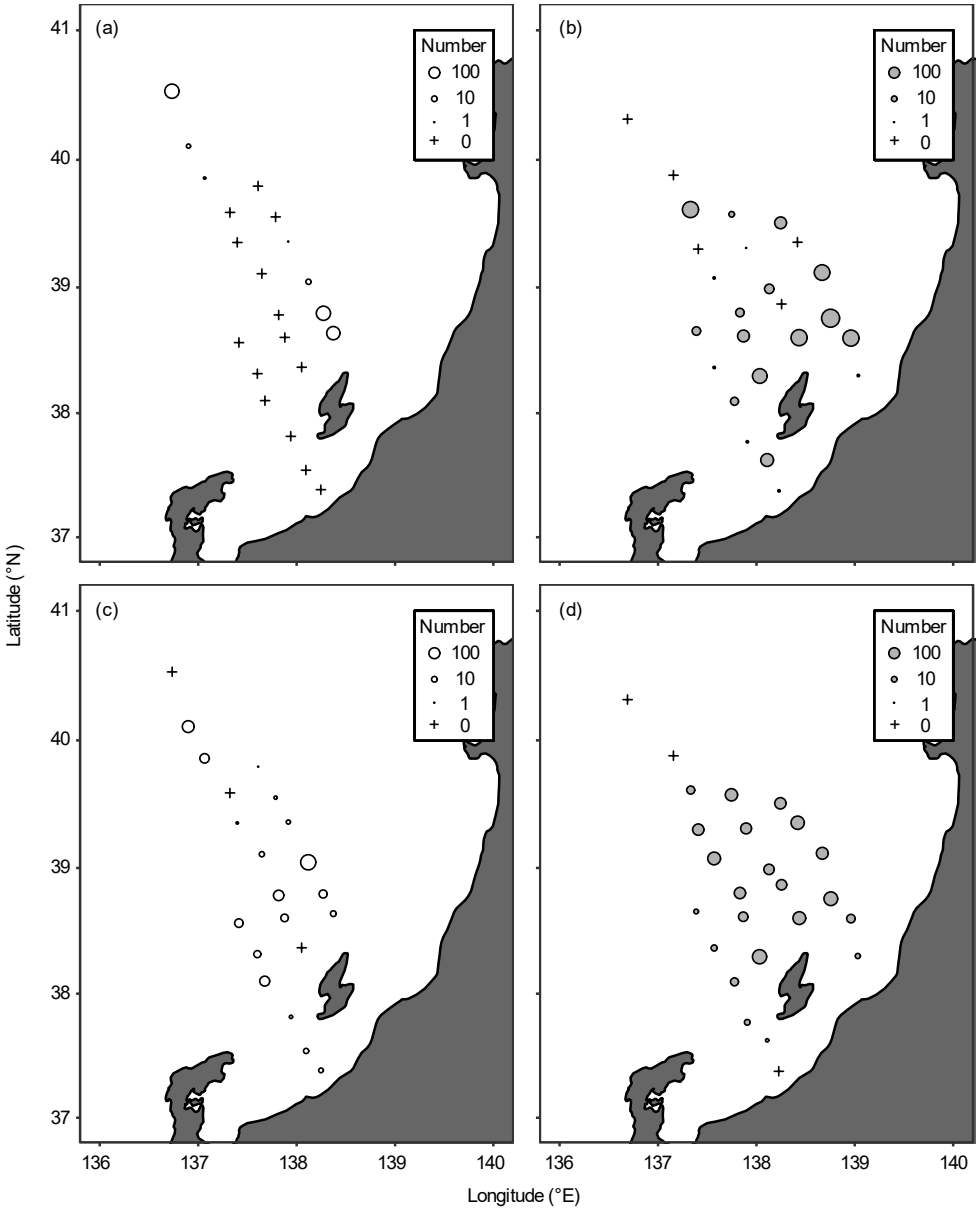

Figure S2. Number of catch of Japanese anchovy (*Engraulis japonicus*) (a, 2017; b, 2018) and small squid (*Enoploteuthis chunii*) (c, 2017; d, 2018) by a surface trawl.