

Quantitative estimates of isopod resource utilization using a Bayesian fatty acid mixing model

A. W. E. Galloway^{1,4,*}, M. E. Eisenlord¹, M. N. Dethier¹, G. W. Holtgrieve², M. T. Brett³

¹Friday Harbor Laboratories, University of Washington, Friday Harbor, Washington, USA

²School of Aquatic and Fishery Sciences, Box 355020, University of Washington, Seattle, Washington 98195–5020, USA

³Civil and Environmental Engineering, Box 352700, University of Washington, Seattle, Washington 98195–2700, USA

⁴Present address: Department of Ecology, Environment and Plant Sciences, Stockholm University, 10691 Stockholm, Sweden

*Corresponding author: gway@uw.edu

Marine Ecology Progress Series 507:219–232 (2014)

Supplement. Site characteristics, fatty acid summary data for experimental and wild isopods, and results of model methods test

Table S1. Site names, abbreviations, and characteristics for the wild *Idotea* sampling, conducted 24 June through 7 July 2013. ‘Fetch’ is the maximum straight line open water distance, ‘Tide’ is the tidal range, defined as the height (m) from the mean lower low water tide line to the top of the algal zone, GPS coordinates are accurate to $\sim\pm 11$ m, and n is the number of replicate *Idotea* collected at each site for biochemical analyses.

Site	Fetch (km)	Exposure	Tide (m)	GPS coordinates	n
Friday Harbor Labs (FHL)	11.4	Protected	1.3	48.5458, –123.0117	5
Eagle Cove (EC)	57.2	Semi-Protected	1.3	48.4613, –123.0315	5
Cattle Point (CP)	85.5	Exposed	1.3	48.4507, –122.9659	5
Ledgewood (LG)	79.9	Semi-Protected	1.3	48.1426, –122.6047	5
Richmond Beach (RB)	21.1	Semi-Protected	2.4	47.7636, –122.3865	5
Magnolia (MN)	22.1	Protected	2.4	47.6324, –122.3784	5

Table S2. Fatty acid summary data (% of 28 total FAs identified) for wild and experimental isopods. n is the number individual isopods analyzed for wild samples and the n of true experimental aquaria replicates (~20 juvenile isopods pooled per aquaria; see ‘Materials and methods’). *indicates 8 PUFA used in FASTAR modeling analysis (see ‘Materials and methods’)

Site/Diet n FA	Wild isopods												Experimental isopods fed														
	FHL		EC		CP		LG		RB		MN		<i>Ulva sp.</i>		<i>Nereocystis</i>		<i>Fucus</i>		<i>Sachharina</i>		<i>Mazzaella</i>		<i>Porphyra sp.</i>		<i>Smithora</i>		
	ave	sd	ave	sd	ave	sd	ave	sd	ave	sd	ave	sd	ave	sd	ave	sd	ave	sd	ave	sd	ave	sd	ave	sd	ave	sd	ave
c14:0	2.1	0.5	1.5	0.4	0.9	0.4	0.7	0.2	1.1	0.1	2.3	0.5	0.6	0.2	1.5	0.1	1.5	0.9	0.2	0.0	0.4	0.2	1.1	0.2	0.8	0.3	
c15:0	0.3	0.0	0.3	0.1	0.2	0.1	0.2	0.0	0.3	0.1	0.4	0.1	0.4	0.0	0.1	0.0	0.2	0.1	0.1	0.0	0.4	0.0	0.2	0.0	0.3	0.0	
i-16:0	0.6	0.2	0.5	0.1	0.8	0.4	0.9	0.2	0.5	0.1	0.3	0.1	1.0	0.1	0.6	0.0	0.8	0.4	1.6	0.1	0.9	0.1	1.1	0.1	1.2	0.2	
c16:0	16.7	0.9	19.0	0.4	17.2	1.4	16.7	1.4	19.1	0.8	19.3	0.9	17.2	0.8	15.0	0.3	16.3	0.7	12.9	0.3	15.7	2.0	18.2	1.1	15.1	0.8	
16:1 ω 9	0.1	0.0	0.2	0.0	0.1	0.1	0.1	0.0	0.2	0.0	0.2	0.0	0.1	0.0	0.2	0.0	0.2	0.1	0.1	0.1	0.1	0.0	0.2	0.0	0.2	0.1	
16:1 ω 7	2.6	0.4	4.0	0.6	3.2	1.1	2.5	0.6	3.8	0.4	3.8	0.9	2.0	0.4	2.9	0.3	2.4	0.5	3.2	0.1	2.4	0.4	3.4	0.1	3.7	0.4	
16:1 ω 5	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.1	0.1	0.3	0.0	0.1	0.0	0.2	0.0	
c17:1	0.1	0.1	0.1	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.1	0.1	0.5	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.2	0.1	0.1	0.1	0.0	0.0	
16:4 ω 3*	1.1	0.7	2.3	0.2	1.8	1.4	1.9	0.6	4.0	0.8	2.8	0.8	3.6	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.1	
c18:0	4.1	0.7	4.8	0.5	5.7	1.6	6.1	1.1	4.2	0.5	3.7	0.7	6.3	0.5	6.4	0.2	5.5	0.9	8.6	0.1	7.4	0.7	6.5	0.3	6.9	0.6	
18:1 ω 9	16.1	1.7	17.5	1.9	12.5	0.8	12.4	1.4	14.7	1.1	18.1	1.4	10.0	1.7	14.3	0.3	15.5	0.7	14.0	0.2	14.6	1.1	16.1	1.0	10.7	0.4	
18:1 ω 7	2.5	0.6	3.6	0.6	4.7	0.7	5.4	0.5	5.4	0.5	3.3	0.8	7.8	0.3	3.0	0.1	3.5	1.7	6.3	0.4	6.2	2.2	3.7	0.3	9.8	0.4	
18:2 ω 6*	7.3	1.1	3.1	0.3	3.5	0.8	2.7	0.2	3.1	0.1	5.5	0.9	3.6	0.7	3.3	0.1	6.6	1.8	2.1	0.1	0.5	0.0	1.1	0.1	1.0	0.0	
18:3 ω 6	0.5	0.1	0.4	0.0	0.3	0.2	0.3	0.1	0.4	0.1	0.5	0.1	0.6	0.1	0.6	0.0	0.3	0.2	0.3	0.0	0.1	0.1	0.1	0.0	0.1	0.1	
18:3 ω 3*	7.3	1.2	7.7	0.6	6.6	2.7	9.6	1.6	11.7	1.0	10.8	1.5	15.0	0.9	4.5	0.2	3.0	0.8	2.1	0.3	0.7	0.1	0.4	0.0	1.8	0.1	
18:4 ω 3*	4.2	0.8	5.8	0.4	3.7	2.2	2.7	0.8	6.3	1.0	4.8	0.2	5.8	0.4	7.0	0.6	2.1	0.7	1.7	0.2	0.0	0.0	0.3	0.0	0.9	0.3	
c20:0	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.3	0.0	0.2	0.1	0.3	0.0	0.2	0.0	0.2	0.0	0.2	0.0	
20:1 ω 9	0.8	0.2	0.8	0.1	0.8	0.1	1.4	0.2	0.6	0.1	0.5	0.1	0.6	0.0	0.9	0.0	0.8	0.1	0.9	0.0	1.3	0.0	3.3	0.1	0.6	0.0	
20:1 ω 7	0.0	0.0	0.1	0.0	0.1	0.1	0.2	0.0	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.3	0.1	
20:2 ω 6	1.6	0.5	0.7	0.1	1.0	0.5	0.9	0.2	0.5	0.1	0.8	0.2	0.8	0.3	1.0	0.1	1.6	0.1	1.0	0.1	0.4	0.1	1.2	0.1	0.3	0.0	
20:3 ω 6	0.6	0.1	0.4	0.1	0.6	0.1	0.8	0.1	0.3	0.1	0.5	0.1	0.6	0.0	0.5	0.0	1.0	0.5	0.1	0.1	0.4	0.0	1.3	0.1	0.2	0.0	
20:4 ω 6*	10.1	1.7	5.3	0.5	6.2	2.8	4.1	0.9	2.9	0.7	6.4	1.7	2.6	0.3	12.7	0.6	17.1	1.3	14.9	0.6	9.7	0.5	7.5	0.5	1.6	0.1	
20:4 ω 3	0.9	0.0	1.0	0.1	1.0	0.2	1.2	0.2	1.1	0.1	1.0	0.1	1.8	0.1	1.7	0.1	0.6	0.1	0.8	0.1	0.0	0.0	0.2	0.0	0.9	0.1	
20:5 ω 3*	15.8	2.6	15.8	1.1	23.2	4.2	21.3	2.6	12.9	1.1	10.8	1.5	9.1	1.4	16.3	0.5	17.0	4.2	22.2	0.2	31.5	1.3	30.1	1.3	36.9	0.9	
c22:0	0.2	0.0	0.4	0.1	0.4	0.1	0.3	0.1	0.3	0.1	0.2	0.0	0.5	0.1	0.4	0.0	0.3	0.1	0.4	0.0	0.6	0.0	0.2	0.0	0.2	0.0	
22:4 ω 6	0.1	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.4	0.0	0.2	0.0	0.1	0.1	0.1	0.1	0.2	0.0	0.1	0.1	0.0	0.0	
22:5 ω 3*	0.9	0.4	1.1	0.2	1.3	0.2	1.9	0.3	1.7	0.2	0.9	0.2	3.1	0.3	0.3	0.0	0.2	0.1	0.5	0.1	1.0	0.1	0.4	0.0	0.6	0.0	
22:6 ω 3*	0.5	0.2	0.7	0.2	1.0	0.4	1.1	0.4	1.3	0.4	0.3	0.1	0.4	0.1	0.3	0.0	0.5	0.2	1.3	0.1	0.9	0.2	0.5	0.1	2.0	0.1	

Results of FASTAR internal ‘methods test’

To test the ability of FASTAR to identify the known diets of experimental isopods, one replicate isopod was randomly selected from each of the library treatment taxa and analyzed as 1 of 3 replicates within the ‘group’ of animals fed red, brown, or green algae.

Table S3. 5th, 50th, and 95th percentiles (i.e. 90% Bayesian credibility interval [BCI]) of the FASTAR-generated isopod diet solution for each group of animals fed red, brown or green algae (following the format of Table 3)

Known diet	n	Green		Brown		Red	
		Median	90% BCI	Median	90% BCI	Median	90% BCI
Red	3	0.01	(0.00-0.06)	0.04	(0.00-0.18)	0.93	(0.80-0.99)
Brown	3	0.00	(0.00-0.01)	0.84	(0.45-0.99)	0.16	(0.01-0.54)
Green	3	0.96	(0.91-0.99)	0.01	(0.00-0.05)	0.02	(0.00-0.07)

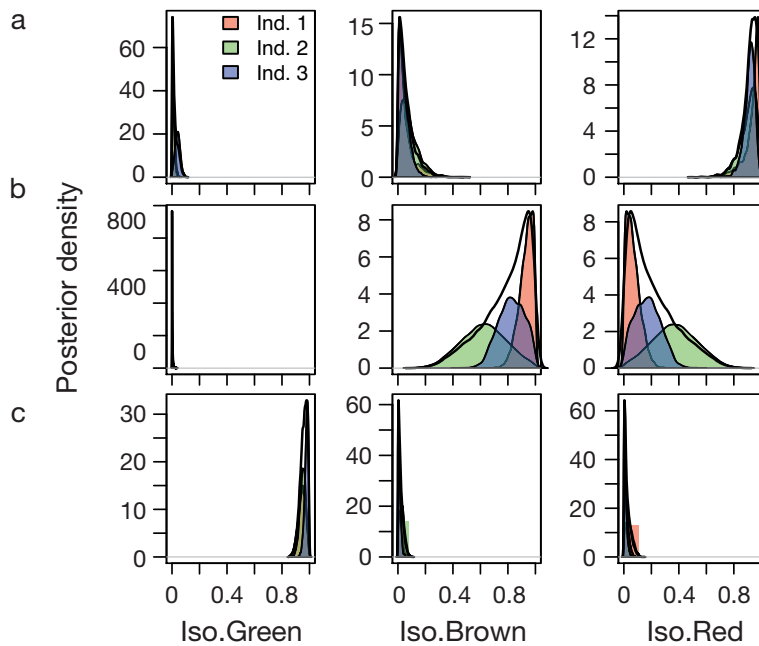


Fig. S1. Individual model solutions (colors) as proportions (x -axis) estimated for isopods fed green (Iso.Green), brown (Iso.Brown), and red (Iso.Red) algae and the group posterior densities (y -axis). Panels are isopods grouped by what they were actually fed: a) red, b) brown, and c) green algae