Supporting Information

Text S1. Detailed explanation of relative zooplankton abundance scoring from GoPro videos

We extracted still images every 5 seconds from the upcast of the GoPro videos. The depth of the GoPro at each still image was matched to the image using data from the TDR. The still images were divided into 3x3 cell grids (SI Figs. 1a-h). These grid cells were assigned a score from 0-5 relative to the number of zooplankton present in that cell. A score of 0 indicated an absence of zooplankton in that cell, while a score of 5 represented the highest relative zooplankton abundance. NAs were assigned to grid cells if they were obscured due to high turbidity, low lighting, or obstructions (i.e., by kelp, rocks, fish). Scores were assigned by a single analyst (LH) using reference images (SI Figs. 1a-h) to maintain consistency in scoring. Image a is unobscured and clear, allowing the assignment of a score in each grid cell. Images b, c & d have grid cells that are too dark in color/lighting that receive NAs, however the assignment of scores is possible for most grid cells. Images e & f have partially obscured grid cells due to rocks (e) and kelp (f) that receive NAs, however the assignment of scores is possible for most grid cells. Images g & h are fully obscured by rocks (g) and kelp (h) preventing the assignment of a zooplankton score, resulting in NAs.

To ensure consistency of scoring by the single analyst (LH), we conducted a test where 60 images were randomly subsampled (*n*=20 from each year) and re-scored by the analyst. This test was conducted approximately 1.5 years after the original scores were assigned. To confirm the two measurements were comparable, we calculated the coefficient of variation. Results showed a mean CV% = 1.18% (sd=0.12, min=0, max=1.41), indicating that the analyst produced comparable measurements.

Text S2. Detailed explanation of daily abundance and caloric preyscape creation

Daily abundance preyscapes

We created initial daily spatial prey layers used in whale analyses by combining prey composition and abundance data from the stations with a model of zooplankton distribution (SI Fig. 4). Spatial layers of relative prey abundance per study site (MR and TC) were created for each prey sampling day based on the summed relative prey abundance value determined for each sampling station. Since marine prey are patchy, inverse-distance weighting (IDW) interpolation was deemed the most appropriate method to extrapolate observed values at one location to areas where no sampling occurred given IDW's conservative and straightforward spatial assumptions (Lam, 1983). Therefore, IDW interpolation using an n_{max} =1 and h value (maximum distance) of 237.75 m produced interpolated daily observed zooplankton distribution layers.

To enhance the realism of these interpolated layers, we included *a priori* knowledge on zooplankton ecology and distribution. Our GoPro casts and published literature (Clutter 1969, Feyrer & Duffus 2011, 2015) indicated that zooplankton are often associated with rocky reef habitats that contain kelp, and less so with sandy substrate. Therefore, we modeled the relationship between distance to kelp and habitat type on relative zooplankton abundance using generalized additive models (GAM) with a Tweedie distribution (SI Fig. 3). An annual distance to kelp layer was calculated using the theodolite mapped kelp extent polygons at the end of each sampling season. A benthic substrate layer for each study site (MR and TC) was created through supervised classification using an established meso-scale habitat layer for coastal Oregon (C. Goldfinger and C. Romsos, Active Tectonics and Seafloor Mapping Lab, Oregon State University) as the base, which was refined using bottom type assessments from GoPro casts. These final benthic substrate layers were created for each year, had a spatial resolution of 20.3 m, and included the following classes: reef with kelp, reef with no kelp, and sandy bottom. We also included tide level and Secchi disk depth as variables in the models. We used Akaike's information criterion (AIC) to select the most parsimonious and best performing model.

The IDW interpolated daily observed zooplankton distribution layers were then multiplied by the GAM modeled expected daily zooplankton distribution layers to produce daily informed interpolations of zooplankton distribution (IDW * GAM). These daily informed interpolations accounted for the inherent patchiness of zooplankton by integrating *a priori* ecological knowledge of zooplankton distribution. These daily informed interpolations are hereafter referred to as the relative abundance of prey.

Daily caloric preyscapes

Zooplankton captured at each station in the net tows were identified to species, and the proportion of each species captured was calculated to describe prey community availability. IDW interpolations of these proportions were made per species per day. These species proportion interpolations were then multiplied by the daily relative abundance of prey layer to obtain species-specific relative abundance layers. These species-specific relative abundance layers were then multiplied by the mean caloric value for each species (Hildebrand et al. 2021), resulting in daily spatial layers for each study site of species-specific relative caloric availability. A total relative caloric layer was derived by summing the species-specific relative caloric layers together. The caloric content of zooplankton species relevant in this study does not differ between years (Hildebrand et al. 2021) and therefore we did not need to account for temporal differences in our daily caloric preyscapes.

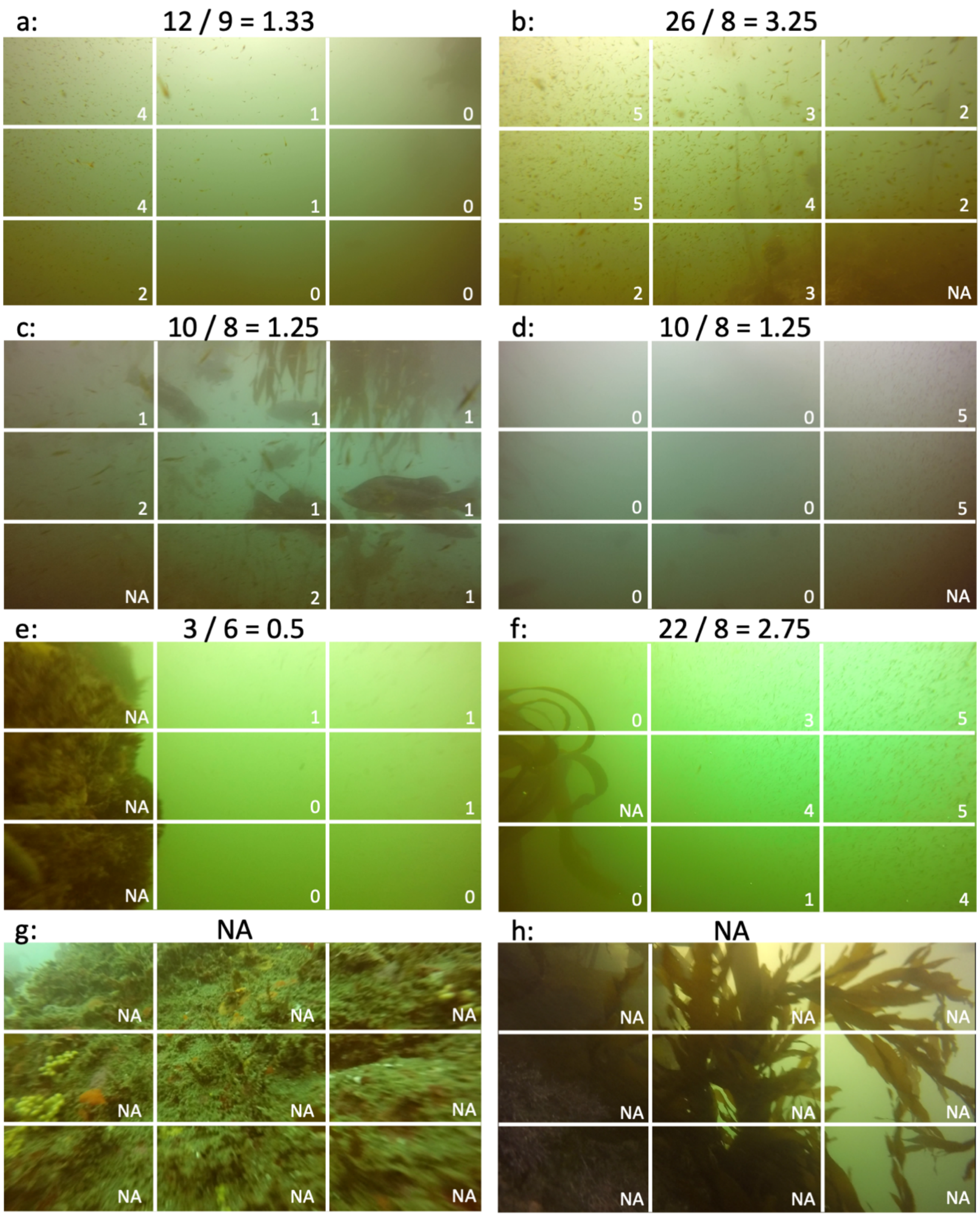

Figure S1. (a-h) Examples of GoPro video still images with overlaid 3x3 grid used to score images for relative zooplankton abundance estimation. Grid cells have been assigned classification scores of relative zooplankton abundance (0-5 and NA). The different images represent different examples of clarity and obstruction that were observed from GoPro videos. Above each image is the mean relative zooplankton abundance calculated for each still image as it is the sum of all numeric scores divided by the total number of grid cells (excluding NAs).

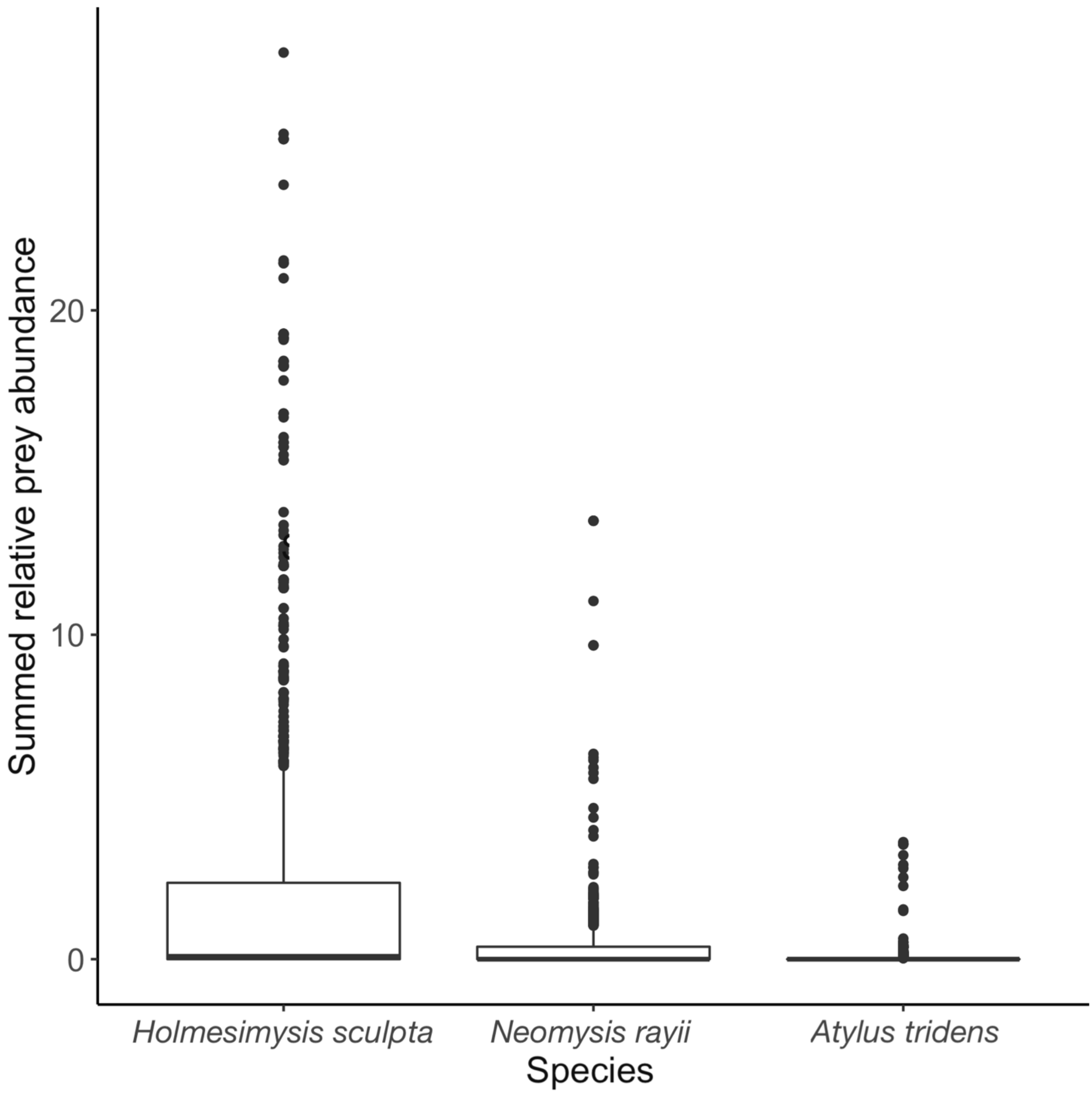

Figure S2. Summed relative abundance of the three prey species (*Holmesimysis sculpta, Neomysis rayii, Atylus tridens*) across all three sampling years. Relative abundance of *H. sculpta* is significantly higher than the relative abundances of *N. rayii* and *A. tridens* (ANOVA F = 472.2, df = 2, $p < 0.001$).

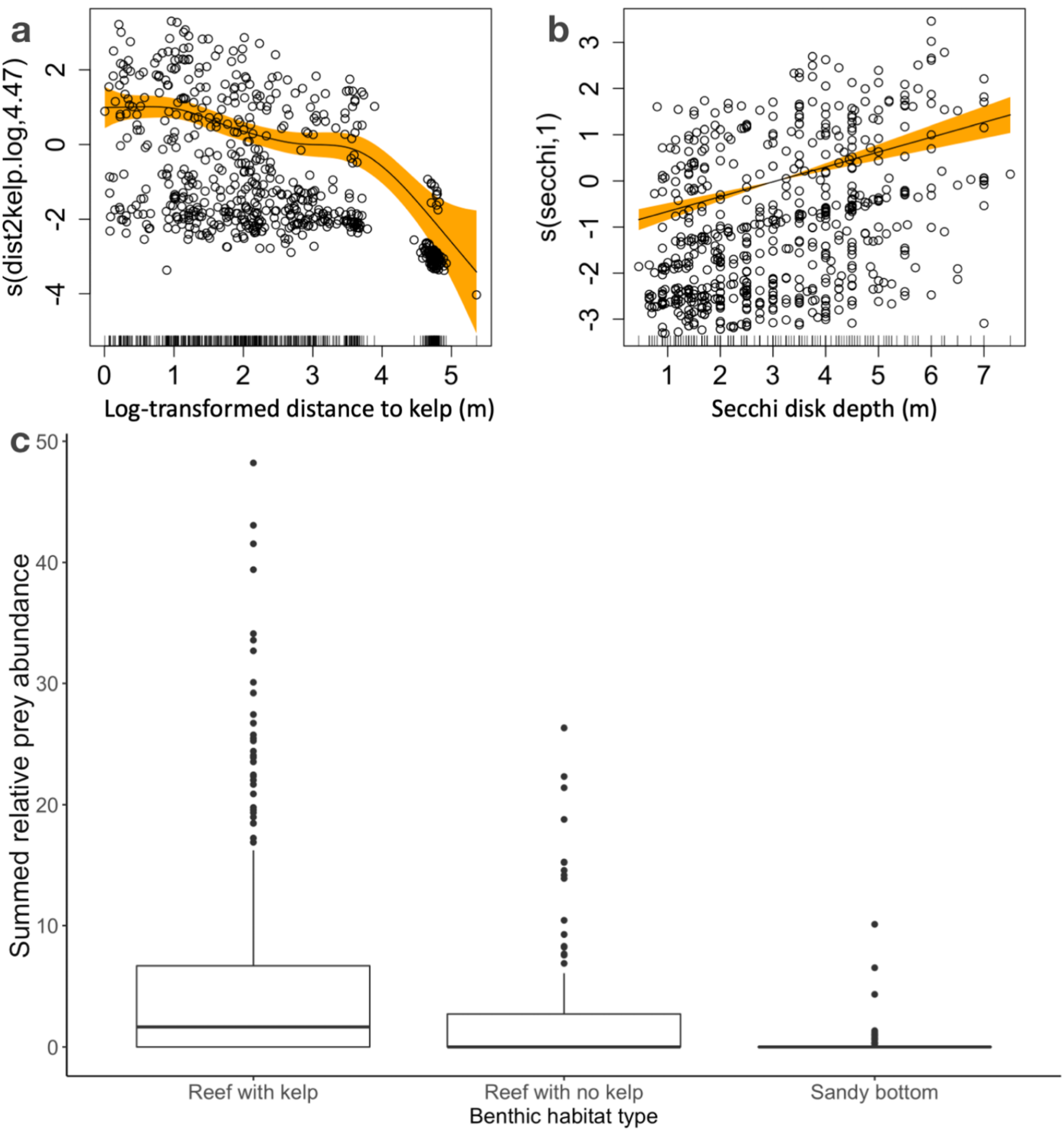

Figure S3. Relationship between summed relative prey abundance from daily GoPro casts per station with the significant variables ((a) log-transformed distance to kelp, (b) Secchi disk depth, and (c) benthic habitat type) in the selected generalized additive model (Model 2) used to create the modeled expected daily zooplankton distribution layers.

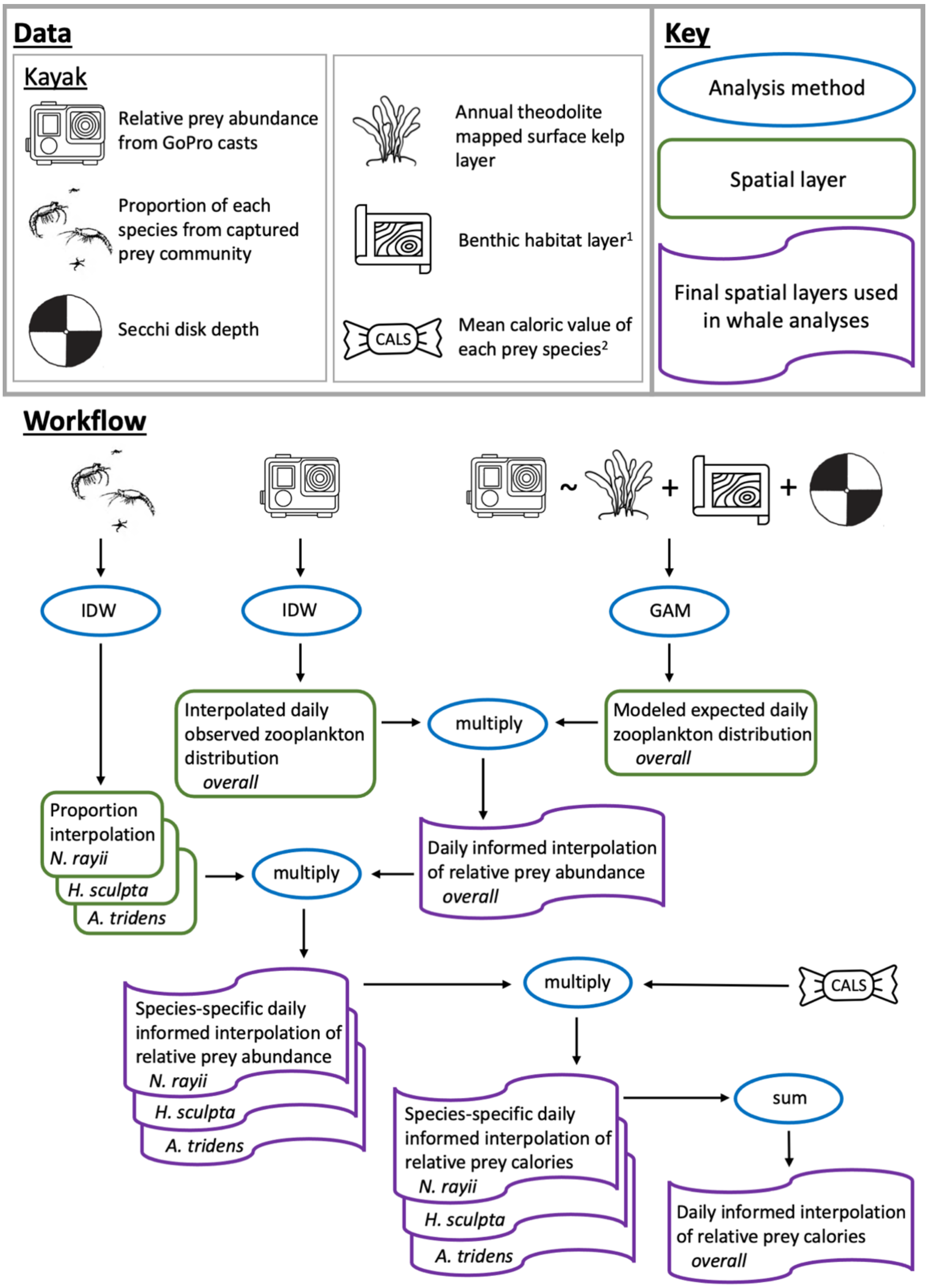

Figure S4. Schematic workflow of the data and steps used to create the daily layers of relative prey abundance and calories for all prey available (overall) and by individuals prey species (*Neomysis rayii, Holmesimysis sculpta, Atylus tridens*). [1]Benthic habitat layer provided by C. Goldfinger and C. Romsos, Active Tectonics and Seafloor Mapping Lab, Oregon State University. [2]Mean caloric values of each prey species taken from Hildebrand et al. (2021). IDW stands for Inverse Distance Weighting interpolation; GAM stands for Generalized Additive Model.

Table S1. Generalized additive model (GAM) results for relative prey abundance in relation to environmental predictor variables. Statistically significant results are in bold.

Parameter	**Model 1**		**Model 2**	
Family	Tweedie			
Link function	log			
Adjusted R^2	0.241		0.237	
Deviance explained (%)	36.6		36.1	
AIC	2159.3		2414.9	
Covariates	Estimate	*p-value*	Estimate	*p-value*
Benthic habitat				
Reef_with_kelp	0.854	**< 0.001**	0.893	**< 0.001**
Reef_no_kelp	-0.428	**0.011**	-0.494	**0.002**
Sandy	-1.86	**< 0.001**	-1.81	**< 0.001**
$_{log}$dist2kelp	10.9	**< 0.001**	12.0	**< 0.001**
secchi	47.4	**< 0.001**	54.0	**< 0.001**
tide_level	0.843	0.417	-	-

Literature Cited

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