Estimation of total Gammarid and caprellid amphipod availability per 0.1 m^2

Gammarid and caprellid amphipod availability was calculated as the estimated mean density of each within suitable foraging habitat for black surfperch multiplied by the cover of those habitats (all foliose and turfing algae for gammarids; only the bushy red alga *Gelidium* spp. for caprellids). Biomass of available prey in foraging habitats was estimated by collecting all algal taxa within 10 to 12 selected 0.1 m^2 quadrats at each of 3 depth contours (3, 6, 9 m) at 3 sites (Figure 1, Figure 2, infrequently 1 or 2) and estimating prey biomass and amount of algal substrata therein. Quadrats were randomly selected from patches of suitable foraging substrata spaced along the transect.

The percent cover of suitable foraging habitat along each transect was estimated at all sites using random point contact (RPC) surveys that consisted of recording the dominant taxa (or physical substrate if unoccupied) at 320 points per transect (Figure 2).

Gammarid amphipods live in many algal substrata and because collected 0.1 m^2 samples targeted foraging substrata (as opposed to fully randomly placed along transects without discretion) we effectively sampled the density of gammarid amphipods within suitable foraging substrata. We counted and measured individuals and estimated biomass from length-weight relationships in sampled plots in each year. We then estimated mean gammarid density per unit area of suitable foraging habitat using a generalized linear model (glm) with Poisson distributed errors on the mass of gammarids (rounded to the nearest mg) for each year. This estimated mean for each year was then multiplied by the number of 0.1 m^2 plots that contained foraging substrata on each transect to get total mass of gammarids on each transect in a given year.

Caprellid amphipods reside primarily in red algae of the genus *Gelidium,* particularly *G. robustum.* We estimated caprellid biomass within *G. robustum* by multiplying counts of caprellids by the mean mass per individual because caprellids varied little in size. Because caprellids are primarily suspension feeders and are observed resting on the outer surfaces of *G. robustum*, we estimated the relationship between caprellid amphipods and the cube root (a proxy for outer surface area) of *G. robustum* mass. To do this we fit a generalized linear model with Poisson distributed errors to the collected algal samples. This model included additive year and *Gelidium* terms, as well as an interaction term. Thus, the nature of the relationship between number of caprellids and the intercept varied from year to year. Total caprellid biomass pertransect was estimated as the product of predicted counts from this model, the mean mass per individual, and the percent cover of *G. robustum* . We estimated that for a patch of *G. robustum* to dominate a 0.1 m^2 plot (set at a minimum of 65% cover) the plot needed to contain at least 216 g of *G. robustum.* This was done by fitting a linear regression to estimated percent cover in plots containing 0-100% cover of *G. robustum* for which the mass of *G. robustum* was known. We then multiplied the predicted mass of caprellids in each year for a given 0.1 m^2 plot with 216 grams of *G. robustum* (from the glm above) by the estimated number of 0.1 m^2 plots dominated by *G. robustum*. Thus, this metric represents a conservative index of the total availability of caprellid biomass.

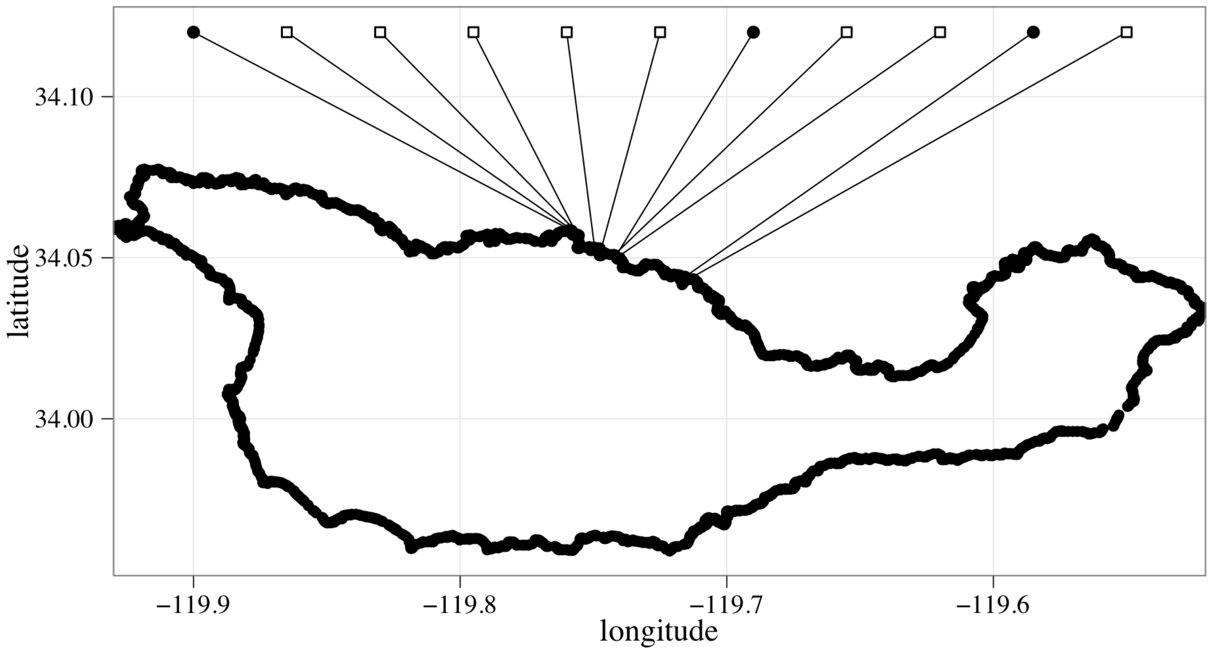
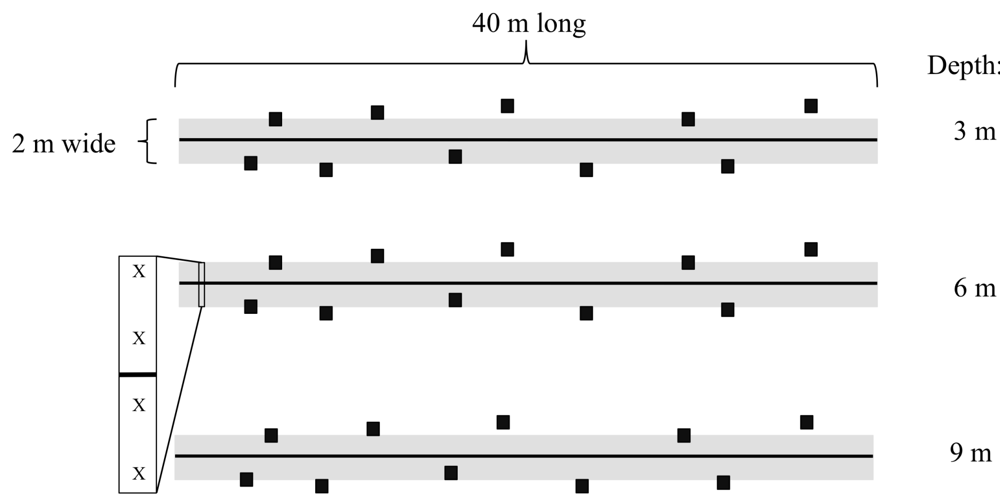


Figure 1: Map of site locations on Santa Cruz Island, California. The map extent is 50 km. Sites at which prey density sampling are conducted are indicated by closed circles.



Symbol	Subject	Survey Method
■	prey density	benthic quadrat sample (0.1 x 0.1 m, 10 / depth contour)
X	habitat	random point contact (4 random points at 80 random, predetermined locations along the transect = 320 points)
	fish	80 m^2 visual swath

Figure 2: Schematic of prey, habitat, and fish survey design within each site. The dark line at each depth represents the fixed transect line. All 11 sites are subject to fish and habitat surveys, and prey density is estimated at three of these sites.