5.7.2 ANALYSIS OF MACROINVERTEBRATE FUNCTIONAL GROUPS

5.7.2a Functional Feeding Groups

Functional feeding groups (FFG) are a classification approach that is based on morpho-behavioral mechanisms of food acquisition rather than taxonomic group. The same general morpho-behavioral mechanisms in different species can result in the ingestion of a wide range of food items (Merritt and Cummins, 1996). The benefit of this method is that instead of hundreds of different taxa to be studied, a small number of groups of organisms can be studied collectively based on the way they function and process energy in the stream ecosystem. Individuals are categorized based on their mechanisms for obtaining food and the particle size of the food, and not specifically on what they are eating. Thus, the functional feeding group method of analysis avoids the relatively non-informative necessity to classify the majority of aquatic insect taxa as omnivores and it establishes linkages to basic aquatic food resource categories (coarse particulate organic matter [CPOM, particles >1mm], fine particulate organic matter [FPOM, particles <1 mm and >0.45 µm], periphyton, and prey) requiring different adaptations for their exploitation.

The major functional feeding groups are 1) ***scrapers/grazers*** which consume algae and associated material; 2) ***shredders***, which consume leaf litter or other CPOM, including wood; 3) ***collector-gatherers***, which collect FPOM from the stream bottom; 4) ***collectors-filterers***, which collect FPOM from the water column using a variety of filters; and 5) ***predators***, which feed on other consumers (Naiman and Bilby, 2001). A sixth category, ***other***, includes species that are omnivores, or simply do not fit neatly into the other categories.

Functional feeding group analyses support the notion that linkages exist in riparian-dominated headwater streams between CPOM and shredders, and FPOM and collectors, and between primary production (e.g., periphyton in midsized rivers) and scrapers. The feeding of shredders on riparian litter affects detrital processing in aquatic systems. About 30% of the conversion of CPOM leaf litter to FPOM has been attributed to shredder feeding (Petersen and Cummins 1974), and this can affect the growth of FPOM feeding collectors (Short and Maslin 1977). In addition, shredder feeding enhances the release of dissolved organic matter (DOM; Meyer and O'Hop 1983). Such analyses link the balance between food resource categories and the predictable response of aquatic insect assemblages.

<u>Functional Feeding Groups in the Carmel River 2000 - 2003</u>
Samples collected during the fall season from mid-Carmel Valley at the CRRR site (see Fig. 5.7.1-A) had the most functionally balanced BMI assemblages (diverse feeding groups), while spring samples collected at Cachagua from the CRCA site had the least functionally balanced BMI assemblages. The higher percentage of scrapers and shredders in the fall season at all sites is likely an indicator of the greater amounts of algal growth on rocks and more leaf litter available in the stream.

A consistent pattern in the distribution of BMIs among the functional feeding groups was not evident for the five primary sites, with the possible exception of higher percentages of BMIs in the "other" FFG category sampled from site CRRR **(Figure 5.7.2a-A)**.

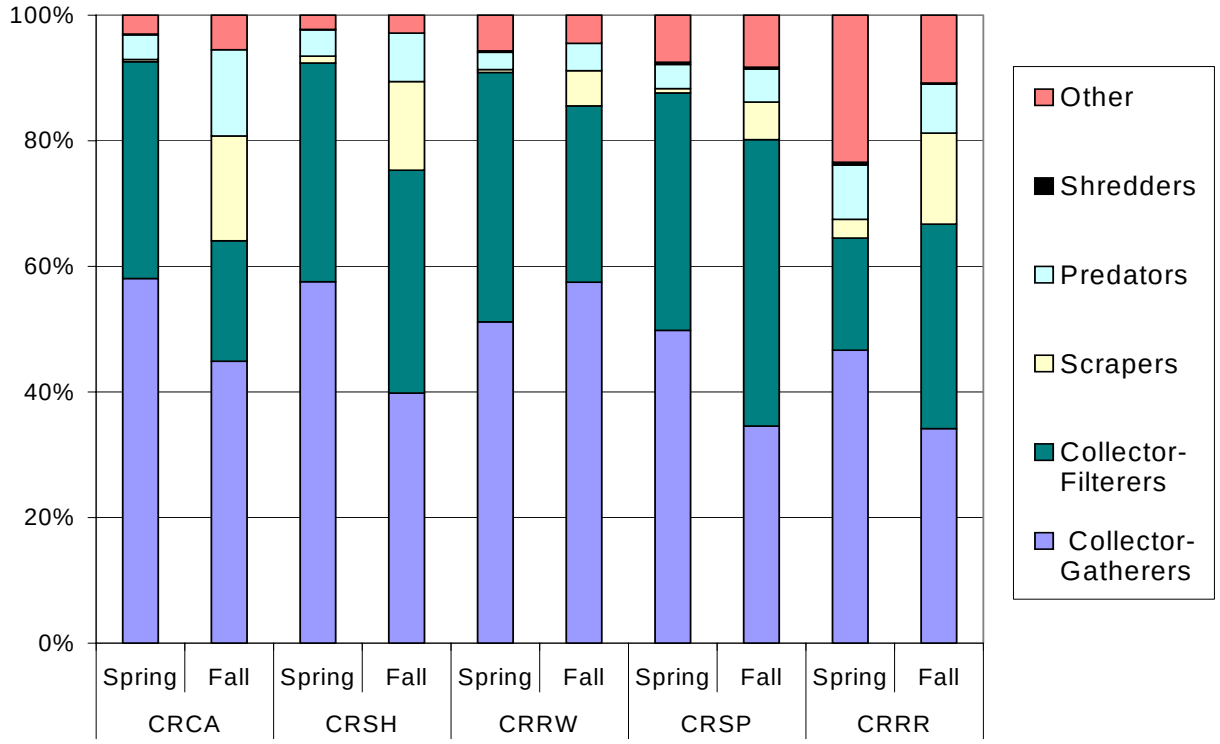

Figure 5.7.2a-A. Percentages of benthic macroinvertebrate functional feeding groups (FFG) sampled from Carmel River monitoring sites 2000 - 2003.

High numbers of individual *Baetis* mayflies, and the midges Orthocladiinae and Tanytarsini contributed to the numerical dominance of the collector-gatherer FFG at each site, except for Stonepine (CRSP) in the fall **(Appendices 5.7.1-C and 5.7.1-D)**. This feeding group typically comprised 35 to 55 percent of the BMI in all samples.

Black flies and hydropsychid caddisflies were the most important contributors to the collector-filterer FFG.

The hydroptilid *Leucotrichia pictipes* was the primary contributor to the scraper FFG but other BMI taxa such as the water penny *Psephenus falli*, the heptageniid mayfly *Ironodes*, and the riffle beetle *Optioservus*, also contributed to the representation of the scraper FFG. There was a trend of higher percentages of scrapers in the fall season when compared to the percentage of scrapers in the spring season.

Several BMI taxa contributed to the predator FFG including the damselfly *Argia*, water mites comprising several genera (mostly *Sperchon*), flatworms, and at some sites dance flies (several genera within the family Empididae).

Shredders were scarce in the samples, comprising between zero and two percent of the FFGs.

Several of the shredders that were present in the samples had low tolerance values, perhaps indicating that a water quality issue may be cause of the scarcity since there did not appear to be a lack of leaf litter in the fall sampling season. The shredding caddisfly, *Lepidostoma*, was the most abundant shredder in the samples but was not numerically dominant at any of the sites.

FFGs listed as "other" include omnivore, xylophage, parasite, macrophyte-herbivore and piercer-herbivore. Localized abundance of the caddisfly *Micrasema*, an omnivore, present in samples collected from site CRRR contributed to the relatively high percentage of the "other" FFG category.