Larval and Juvenile Longfin Smelt Feeding in Restored Tidal Habitats

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Introduction

Food availability strongly influences the quality of nursery habitats and subsequent population dynamics of many fishes. The feeding success and selectivity of Age-0 Longfin Smelt across potential nursery regions and habitats of the San Francisco Estuary (SFE) was examined in relationship to fish size and available prey concentrations.

Methods

Larval and juvenile Longfin Smelt were collected in the spring of 2017 throughout the Northern and Southern regions of the SFE (Figure 1). Fish were dissected and diet contents were identified and enumerated. Copepod samples were also collected corresponding with fish sampling, so ambient prey availability and composition could be estimated. Prey concentrations were calculated as biomass per cubic meter of water sampled. Feeding success was estimated as both feeding incidence (presence or absence of prey in diet) or prey weight (µg) in diet. Longfin Smelt prey preference was also calculated using a Manly's α selectivity index. Feeding success and prey abundance was estimated across regions (Northern and Southern SFE) and habitat types (sloughs, ponds, and open bay).

Figure 1: Study region showing zooplankton sampling and larval/juvenile Longfin Smelt diet samples across the northern and southern SFE. CDFW EMP zooplankton sampling is also shown.

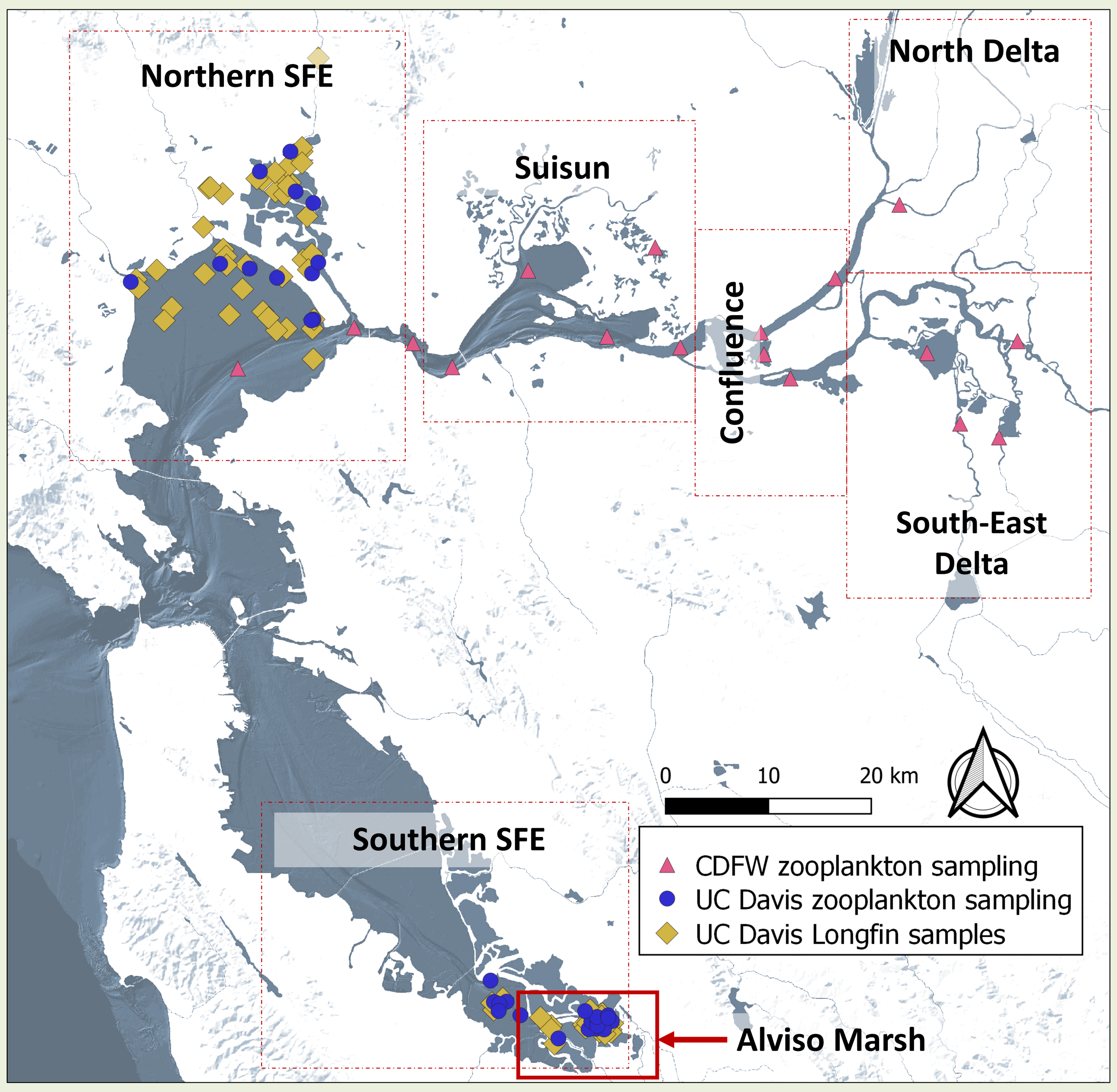
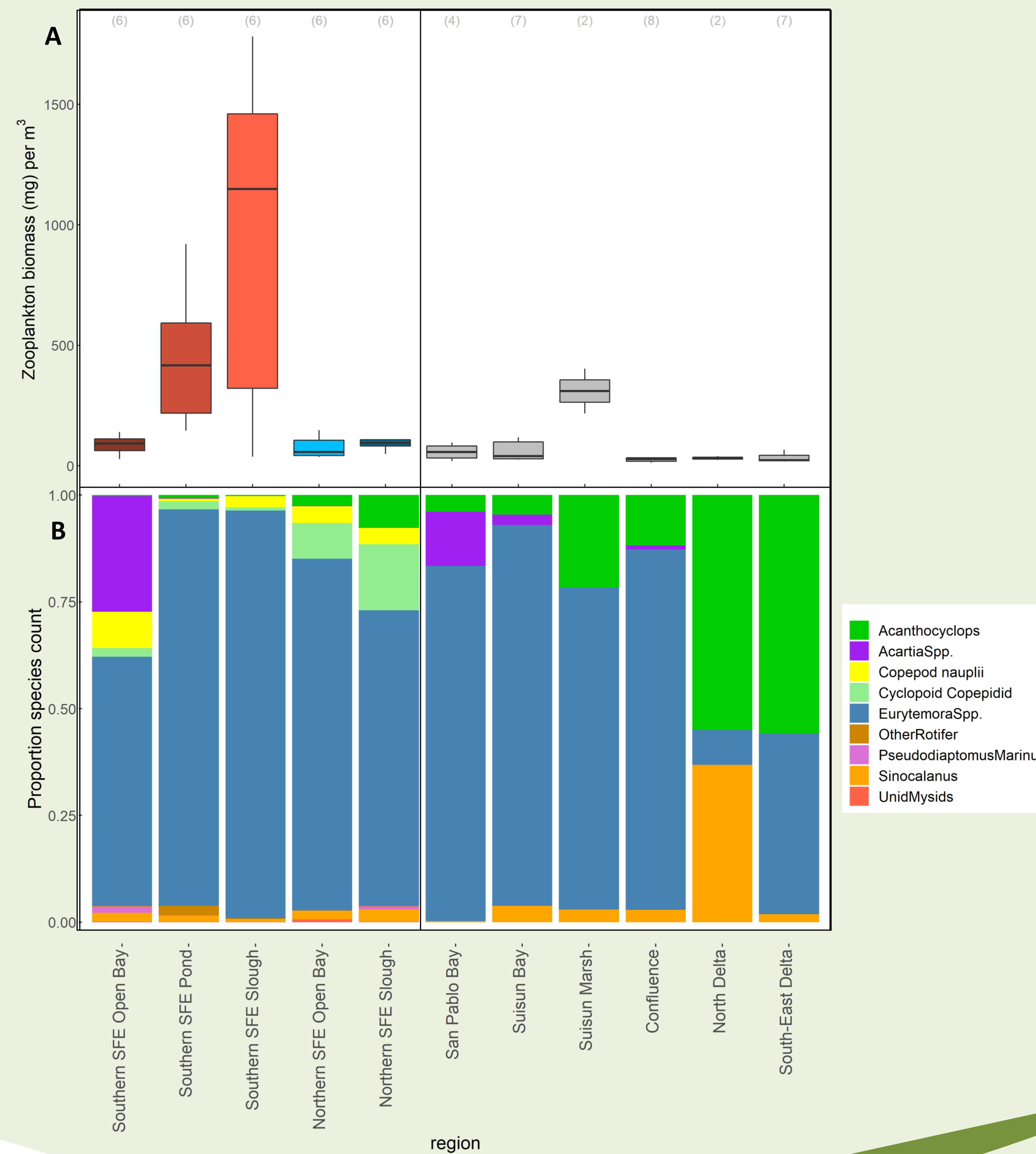


Figure 2: A) Biomass density of zooplankton among regions and habitats of the San Francisco Estuary (March-April 2017). Right panel indicates data from regions of the SFE provided by the CDFW Environmental Monitoring Program during the same sampling period. Sample sizes in parentheses. B) Proportion of CB zooplankton counts for each region, by species.



"Larval Longfin Smelt had greater feeding success in the highly productive Alviso Marsh"

Results

Zooplankton densities were highest in the sloughs of Alviso Marsh in the southern SFE, and in most areas the copepod *Eurytemora affinis* was the most common species. (Figure 2). Age-0 Longfin Smelt of all lengths positively selected for *E. affinis*, with only a few fish having the larger mysid prey in their diets (Figure 3). Mysids did not appear in the diets of Longfin Smelt until fish were longer than 25mm TL (Figure 4). Mass of prey items in Longfin Smelt diets <25mm TL was mostly *E. affinis*, while for fish >25mm TL diet biomass was composed mostly of mysids, even though counts of *E. affinis* were higher. There was no significant difference in feeding success, either feeding incidence or prey weight, found for Longfin Smelt of all lengths between regions or nursery habitats (Figure 6 A and C). However, when examining fish <25mm TL, before mysids were seen in the diet, larval Longfin Smelt in southern SFE sloughs had higher feeding success (Figure 6 B and D).

Figure 3: Selectivity index for all size classes of larval and juvenile Longfin Smelt, showing strong selection for copepod *Eurytemora affinis*. Values above dashed line are positively selected for.

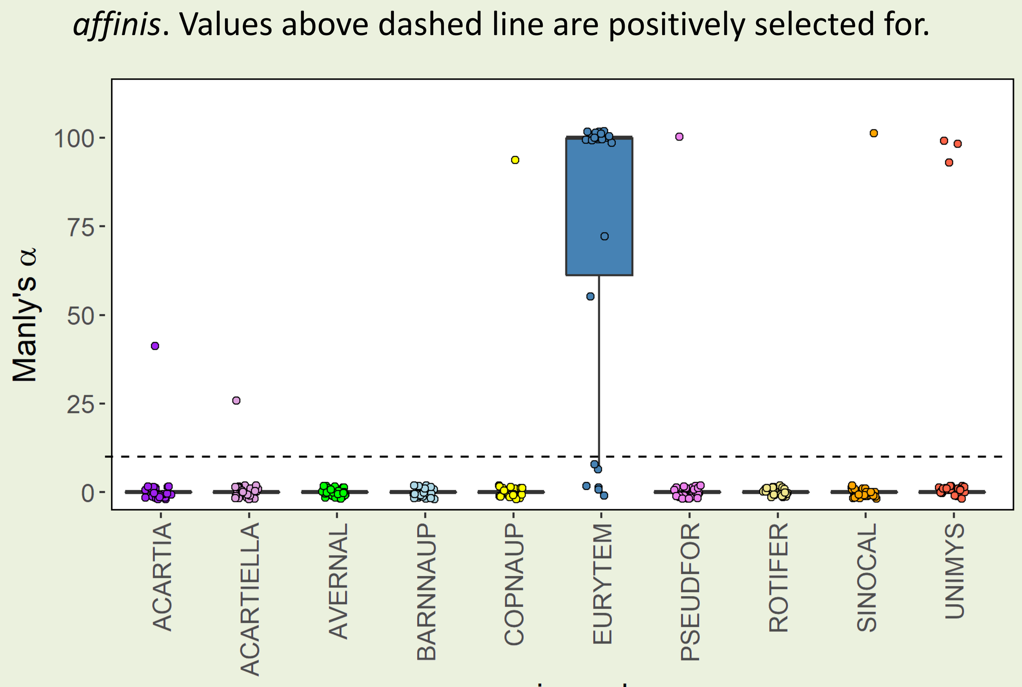


Figure 4: Incidence of mysid prey in Longfin Smelt diets as a function of total length. Data points were jittered to more easily display relative density.

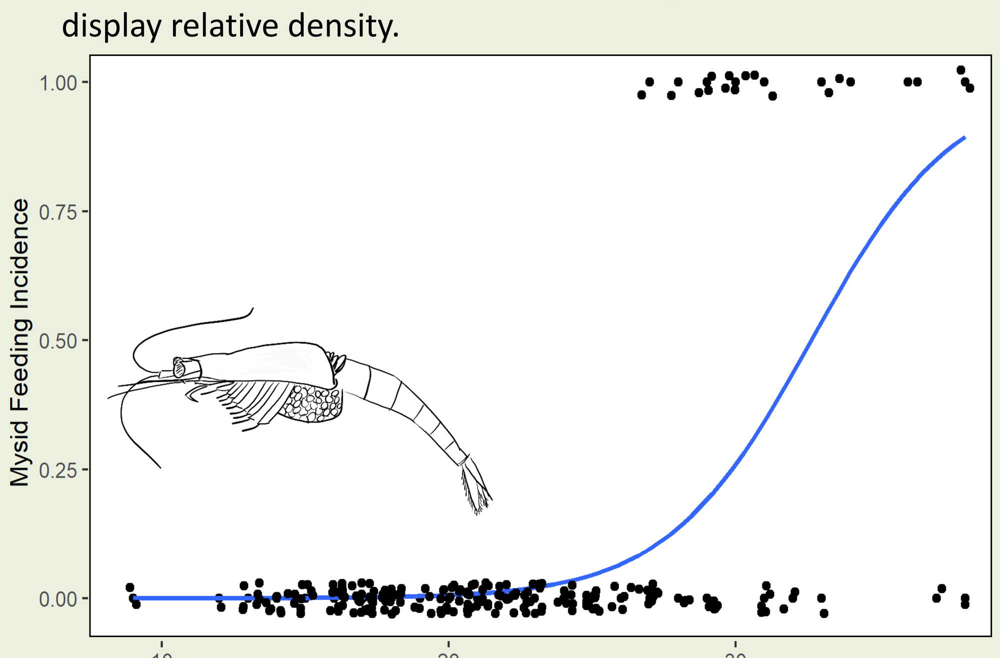


Figure 5: Proportion of the diet by mass of each prey item for A) larval (<25 mm TL) and B) juvenile (>25 mm TL) Longfin Smelt. Copepod and mysid art by Arthur Barros. Larval and juvenile fish art by Adi Khen.

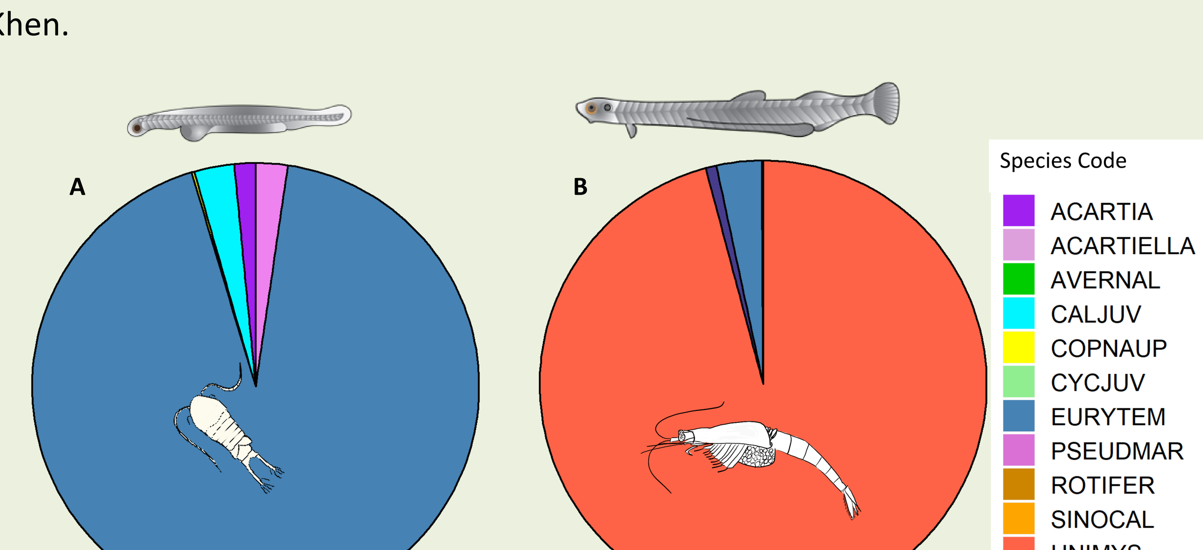
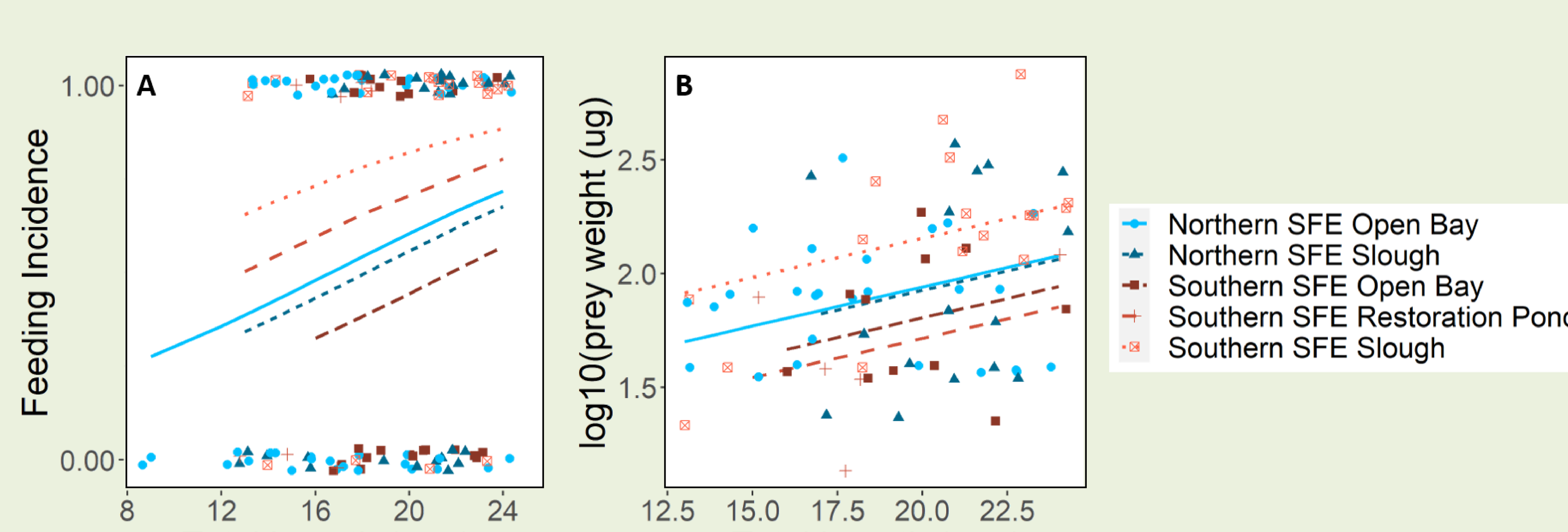


Figure 6: A) Feeding incidence for all length Longfin Smelt and B) larvae <25mm TL. C) Prey weight in diets for all length Longfin Smelt and D) larvae <25mm TLK.



Discussion

Age-0 Longfin Smelt sampled in the sloughs of Alviso Marsh in the southern SFE had higher feeding success and prey availability then those found in other potential nursery habitats. This zone of high zooplankton productivity could be especially important, considering the estuary wide declines of zooplankton abundances since the mid 1980's (Cloern and Jassby, 2012). Higher feeding success and prey concentrations have been shown to lead to faster growth rates and survivorship of larval fishes (Houde 1975, 1978). Identifying variation in food production is one important step towards determining the quality of potential nursery habitats for Longfin Smelt.

Acknowledgements

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References

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