Essential Fish Habitat project status report

Reporting date: 10/22/2012

Project number: 2009 - 11

Title: Contrasting predation intensity and distribution in 2 rock sole nursery areas: a principle factor controlling nursery productivity – Component B..

PIs: Ryer, Laurel, Knoth

Funding year: 2009

Funding amount: $13,000

Status: ☒ Complete ☐ Incomplete, on schedule ☐ Incomplete, behind schedule

Planned completion date if incomplete:

Reporting: This project is now fully complete and reported out. Find attached a manuscript published in Marine Ecology Progress Series (Laurel et al. 2012, MEPS 466:193-203). A brief summary of results is included below.

Results: What is the most important result of the study?

Over the short term, trawl disturbance appears to alter worm tube habitat in a manner that facilitates use by rock sole. Beam trawl data collected 5 hours after the disturbance indicated an increase in age 0 flatfish density across all 4 paired lined comparisons ($p<0.001$; Figure 1). However, longer term monitoring of the experiment (Fig. 2; 141 days) showed a significant interaction in survey time and the treatment effect (trawled or control) at both the worm tube transition depth (15-19.9m) and heavy worm tube depth regions (20-30 m). Analyzed by date, significant effects were restricted to the first sampling period (i.e., 5 hrs after the intervention) i.e., flatfish density

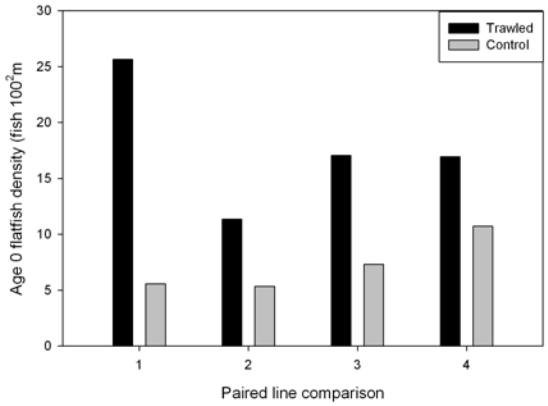

Figure 1. Density of juvenile flatfish from beam trawls towed along paired transects.

increased in trawled areas both at the worm tube transition depths (15-19.9m; $F_{1,194}$=6.697, p=0.003) and heavy worm tube depths (20-30 m; $F_{1,500}$=8.938, p=0.003

To further explore this data we modeled the effects of treatment, patchiness and depth. The effects of patchiness largely overwhelmed depth effects, which generally occurred in regions between 15-20 m (Fig. 3). Worm tube patchiness was relatively higher at intermediate depths (18-22m) at the worm tube transition area in the trawled sites, but this pattern disappeared after 3wks when all sites began to resemble one another. Deeper areas where worm tube density was highest appeared to be relatively unaffected by the trawl disturbance during the entire period.

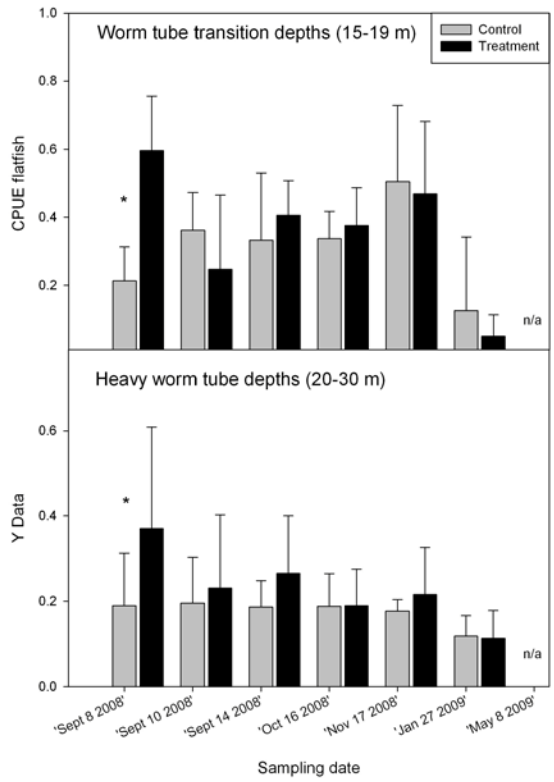

Figure 2. Mean catch per unit effort (CPUE ±SE) for control and disturbed tracts over 8 months over both transitional worm tube seafloor and heavy worm tube seafloor.

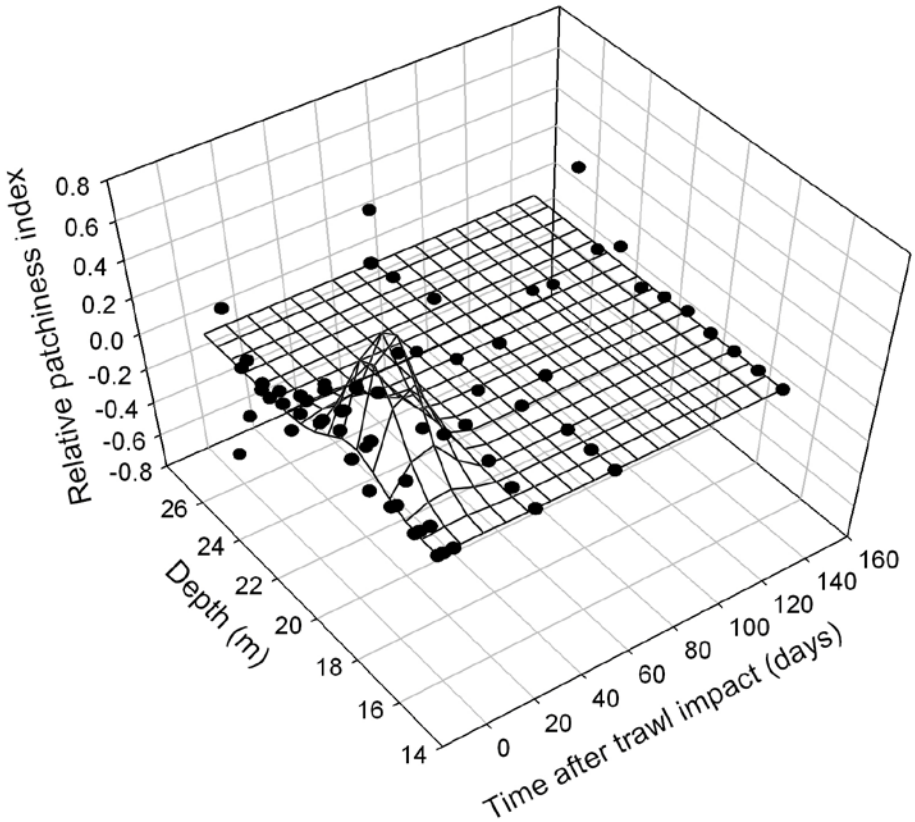

Figure 3. A non-linear 3D regression Gaussian model (f=0.722*exp(-.5*(((x-14.589)/b)^2 + ((y-19.626)/-1.104)^2)); $F_{4,67}$=3.299, p=0.0161) indicates the relative worm tube patchiness (i.e., trawl – control) as a function of time and depth is largely restricted to shallow depth regions and during the first 3-wks of the experiment. High values indicate higher patchiness in trawled regions vs paired control areas whereas values near 0 indicate similar patchiness among sites.

These results indicate that worm tube habitat is susceptible to trawl disturbance, but this is dependent upon worm density. Where worms are dense, simulated trawl gear slides over the bottom, producing only moderate impact, i.e. increased patchiness. In contrast, where worm tubes are sparse or patchy, the simulated trawl gear disturbs the bottom to a greater degree. Juvenile fish, which normally avoid dense worm tube habitat, will infiltrate into these areas after trawling, as a consequence of sand patches being created.