SUPPLEMENTARY MATERIAL 1

Dispersal and population connectivity are phenotype dependent in a marine metapopulation

EMILY K. FOBERT[1], ERIC A. TREML[1,2], STEPHEN E. SWEARER[1,3]

[1] School of BioSciences, University of Melbourne, Victoria 3010, Australia

[2] School of Life and Environmental Sciences, Centre for Integrative Ecology, Deakin University, Victoria 3220, Australia

[3] National Centre for Coasts and Climate, University of Melbourne, Victoria 3010, Australia

SUPPLEMENTARY MATERIAL 1: SUPPLEMENTARY METHODS

Ichthyoplankton sampling

Ichthyoplankton samples were collected on five occasions across two seasons: 20-21 November, and 17-18 December 2012 in the first summer, and 27-28 October, 5-6 November, and 16-17 December 2013 in the second summer. To conduct the depth-stratified sampling, the water column was divided into four strata: surface (top 0-1 m of the water column), 3 m, 6 m, and bottom (approx. 10 m). The strata were sampled in random order, in blocks of four tows that were repeated 6 times in each 24-hour sampling event, with the exception of the November 2012, and October 2013 events, which were terminated after four sampling blocks due to unsafe weather conditions. Surface and mid-water column samples (0 m, 3 m, and 6 m) were collected using a 500 μm mesh plankton net with a circular mouth of 80 cm-diameter and an attached paravane weight. The plankton net was equipped with a choke – a closing mechanism used to prevent the net from sampling during deployment and retrieval (Fig. S1). At the end of the sampling period, while the boat was still in motion, the rope attached to the choke was pulled to tighten the choke, thus closing off the mouth of the net. A 500 μm mesh benthic sled with a rectangular mouth (60 cm x 125 cm) was used for benthic sample collections. The tow speeds for both the plankton net and benthic sled were maintained at approximately 1.5 knots (2.778 km h^{-1}).

For each tow, the net was deployed for 10 min at the predetermined depth. A closing mechanism (choke) was used on the plankton net to prevent the net from sampling while being deployed and retrieved, as this was done while the boat was moving forward. This mechanism was not possible on the benthic sled, though it was less necessary as deployment and retrieval was carried out while the boat remained in one place. A flow meter was fastened to the center of the mouth of both the plankton net and the benthic sled to determine the volume of water filtered in each tow. Following the 10-min sampling period, the choke was

pulled closed and the net was retrieved. The contents of the net were washed with seawater into the cod end, and the collected material was filtered through a 500-µm mesh sieve and immediately preserved in 95% ethanol.

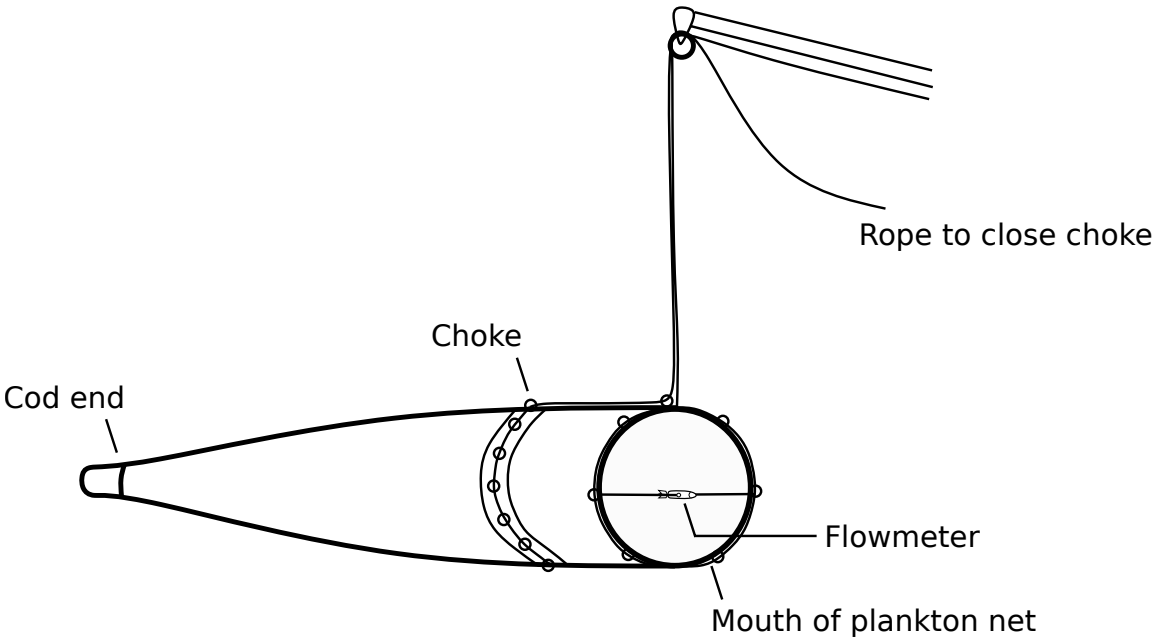

Fig. S1 Side view of 500 µm mesh plankton net (80 cm mouth-diameter) used for icthyoplankton sampling at 0 m, 3 m, and 6 m depths, illustrating the attachment of the flowmeter in the center of the mouth. The choke was pulled to close the net before the net was manually retrieved onto the boat.

Otolith preparation and imaging

The sagittal otoliths were extracted from the collected *T. caudimaculatus* larvae to quantify growth-history and phenotypic traits. Otoliths are calcium carbonate structures within the vestibular apparatus of teleost fishes [1]. The sagittal otoliths, which are roughly ellipsoidal in shape in older fish and generally more round in pre-settlement age larvae, have a record of daily growth increments that can be used to estimate age, previous growth rates,

and major physiological events (e.g. hatch date, settlement date) in the early life history of fishes [2, 3].

Both sagittal otoliths from each fish were placed in immersion oil for at least 24 hours prior to image acquisition. Digital images were collected for one otolith from each fish using an image analysis system comprised of an Olympus BX51 compound microscope (Leica Microsystems, Wetzlar, Germany) fitted with a Canon EOS 60D (Canon, Ōta, Tokyo, Japan) digital camera connected to a PC operating ImagePro Plus v6.3 (Media Cybernetics, Bethesda, Maryland, USA); images for increment analysis were acquired at 40X to 200X magnification. Growth increments along the postrostral axis (or along a radius when an axis was not identifiable, as very young otoliths were entirely round) were tagged using the Caliper Tool package of ImagePro Plus; individual increment widths, and an estimate of size at hatch (measured from the otolith's core to the hatch check) were recorded to the nearest 0.001 μm. Samples were read once by the observer (E. Fobert) who was blind with respect to the metadata associated with each sample (e.g. collection depth, size of fish). A second observer (S. Swearer) verified readings if the daily increments were difficult to identify.

REFERENCES

1. Popper A.N., Coombs S. 1980 Auditory Mechanisms in Teleost Fishes: Significant variations in both hearing capabilities and auditory structures are found among species of bony fishes. *American Scientist* **68**(4), 429-440.

2. Campana S.E., Thorrold S.R. 2001 Otoliths, increments, and elements: keys to a comprehensive understanding of fish populations? *Canadian Journal of Fisheries and Aquatic Sciences* **58**(1), 30-38.

3. Secor D.H., Henderson-Arzapalo A., Piccoli P. 1995 Can otolith microchemistry chart patterns of migration and habitat utilization in anadromous fishes? *Journal of Experimental Marine Biology and Ecology* **192**(1), 15-33.