### JOURNAL PUBLICATION CITATION: Keller, A.G., Grason, E.W., McDonald, P.S., Ramón-Laca, A., Kelly, R.P. 2021. Tracking an invasion front with environmental DNA. *Ecological Applications.*

### Data S1

### Data and code necessary to implement the joint and trap-only models outlined in Equations 1.1 – 1.4.

### Author(s) [of the material provided in DataS1.zip]

Abigail G. Keller

School of Marine and Environmental Affairs, University of Washington

3707 Brooklyn Avenue N.E., Seattle, WA 98105, USA

Abigail.g.keller1@gmail.com

Emily W. Grason

Washington Sea Grant, University of Washington

3716 Brooklyn Avenue N.E., Seattle, WA 98105, USA

egrason@uw.edu

P. Sean McDonald

School of Aquatic & Fishery Sciences, University of Washington

1122 NE Boat St, Seattle, WA 98195, USA

psean@uw.edu

Ana Ramón-Laca

CICOES, University of Washington at Northwest Fisheries Science Center, NOAA

2725 Montlake Blvd E, Seattle, WA 98112, USA

Ana.ramon-laca@noaa.gov

Ryan P. Kelly

School of Marine and Environmental Affairs, University of Washington

3707 Brooklyn Avenue N.E., Seattle, WA 98105, USA

rpkelly@uw.edu

### File list (files found within DataS1.zip)

model\_interface.R

Joint\_model.stan

Trap-only\_model.stan

qPCR\_results.csv

site\_data.csv

trap\_data.csv

**Description**

model\_interface.R – R interface to the Bayesian models written in Stan. Includes data pre-processing, as well as the stan() function (rstan() package) used to read and compile the Stan code and fit the model on the dataset.

Joint\_model.stan – Joint model (Keller et al., Eq. 1.1 – 1.4) specification written in Stan. Accessed via R interface.

Trap-only\_model.stan – Trap-only model (Keller et al., Eq. 1.4) specification written in Stan. Accessed via R interface.

qPCR\_results.csv – Quantitative PCR data used to fit the models. Data include sample ID (Sample), site sampled (Site), date of eDNA sample collection (Date), biological replicate (Bio\_rep), qPCR results from each of three technical replicates (Replicate 1 – Replicate 3), and site region (Region). Each row corresponds to one environmental sample/water bottle.

site\_data.csv – Metadata for each sampled site. Data include the site-specific index for estimated parameter µ (param), site ID (Site), site designation as a location with crabs trapped historically from 2017-2021 (historic\_trap), region associated with site (Region).

trap\_data.csv – Trap data used to fit the models. Data include the full site name (Full\_site\_name), site ID (Site), date of trap sample collection (Date), ID of trap sample (TrapID), number of crabs trapped in trap sample (Count), latitude of trap sample (Latitude), and longitude of trap sample (Longitude).