

Supplementary Material

Vicariance and cryptic diversity revealed by molecular phylogenetic analyses of estuarine *Gammarus* species (Crustacea: Amphipoda) due to formation of the Labrador Current

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Table S1. GenBank accession numbers and location data (as indicated in GenBank) for sequences used in this study.

Scientific name	Location	18S rDNA	28S rDNA	16S rDNA	COI
<i>Barnardiorum shadini</i>	Tajikistan: Hodza Obi-garm	JF966188.1	JF965826.1	–	JF965994.1
<i>Comatogammarus ferghanensis</i>	Tajikistan: Gorno Badakhashan	JF966190.1	JF965828.1	–	JF965996.1
<i>Dikerogammarus villosus</i>	Romania: Babadag (16S rDNA Romania: Tulcea)	KF478613.1	KF478442.1	KM208878.1	KF478533.1
<i>Echinogammarus foxi</i>	France: Leucate	KF478627.1	KF478472.1	–	MK159992.1
<i>Echinogammarus stoerensis</i>	Ireland: Cork County	KF478651.1	KF478515.1	–	KF478601.1
<i>Echinogammarus veneris</i>	Italy: Verona	KF478619.1	KF478456.1	–	KF478546.1
<i>Gammaracanthus loricatus</i>	Norway: Spitsbergen	JF966192.1	JF965830.1	–	JF965998.1
<i>Gammarus balcanicus</i>	Italy: Trieste	JF966136.1	KU056152.1	KU056050.1	JF965903.1
<i>Gammarus cf. bousfieldi</i>	USA: Illinois	EF582899.1	EF582943.1	–	EF570299.1
<i>Gammarus daiberi</i>	USA: Anne Arundel County, Maryland	–	–	–	MH235835.1
<i>Gammarus daiberi</i>	USA: Putnam County, Florida	PP377630	PP377637	PP377640	PP410192
<i>Gammarus duebeni</i>	USA: Maine	AY926781.1	–	JN704067.1	AY926669.1
<i>Gammarus fasciatus</i>	USA: Minnesota	EF582905.1	EF582954.1	EF582858.1	–
<i>Gammarus fossarum</i>	Italy: Trieste	JF966133.1	JF965709.1	–	JF965898.1
<i>Gammarus halilicæ</i>	Macedonia: Lazaropole	JF966134.1	JF965711.1	–	JF965900.1
<i>Gammarus hyalelloides</i>	USA: Texas, Phantom Lake	JF966135.1	MH509711.1	MH509584.1	MH499580.1
<i>Gammarus lacustris</i>	China: Beijing	EF582915.1	EF582964.1	EF582869.1	EF570317.1
<i>Gammarus locusta</i>	Ireland: Cork County	JF966146.1	JF965736.1	–	JF965921.1
<i>Gammarus locusta</i>	Canada: Nunavut	EF582916.1	EF582967.1	EF582870.1	EF570324.1
<i>Gammarus minus</i>	USA: Illinois	EF582918.1	EF582970.1	EF582872.1	EF570326.1
<i>Gammarus nekkensis</i>	China: Hebei	JF966148.1	JF965741.1	EF582874.1	EF570328.1
<i>Gammarus ochridensis</i>	Macedonia: Lake Ohrid	JF966150.1	JF965748.1	JX899044.1	JF965927.1
<i>Gammarus pecos</i>	USA: Texas Diamond Y Spring	JF966154.1	JF965752.1	MH509549.1	JF965931.1
<i>Gammarus pseudolimnaeus</i>	USA: Illinois	EF582922.1	EF582977.1	EF582876.1	EF570333.1
<i>Gammarus pulex</i>	Netherlands	EF582923.1	EF582978.1	EF582877.1	EF570334.1
<i>Gammarus roeselii</i>	Austria: Pram	EF582925.1	EF582981.1	EF582879.1	EF570337.1
<i>Gammarus salemaai</i>	Macedonia: Gradiste (16S rDNA Macedonia: Lake Ohrid)	–	JF965780.1	JX899088.1	JF965955.1
<i>Gammarus seidelii</i>	USA: Texas Caroline Spring	–	MH509695.1	MH509530.1	MH499523.1
<i>Gammarus stankokaramani</i>	Macedonia: Ohrid	–	JF965806.1	JX899132.1	JF965976.1
<i>Gammarus tigrinus</i>	USA: Florida, Volusia County, De Leon Springs State Park; TRS_250_2	PP377628	PP377633	PP377638	PP373659
<i>Gammarus tigrinus</i>	USA: Florida, Volusia County, De Leon Springs State Park; TRS_250_3	PP377629	PP377634	PP377639	PP373660
<i>Gammarus tigrinus</i>	Netherlands	EF582932.1	EF582994.1	EF582890.1	EF570348.1
<i>Gammarus tigrinus</i>	USA: Maryland, Anne Arundel County, SERC; TRS_350_4	PP377631	PP377635	PP373657	PP373661
<i>Gammarus tigrinus</i>	USA: Maryland, Anne Arundel County, SERC; TRS_350_5	PP377632	PP377636	PP373658	PP373662
<i>Gammarus troglophilus</i>	USA: Illinois	EF582933.1	EF582996.1	EF582892.1	EF570350.1
<i>Gammarus wilkitzkii</i>	Norway: Svalvard	JF966182.1	JF965820.1	–	JF965989.1
<i>Jesogammarus hebeiensis</i>	China	MN622583.1	MN622517.1	MN622421.1	MN622357.1
<i>Jugogammarus kusceri</i>	Slovenia: Krka (16S rDNA Slovenia: Gradicek)	KF478622.1	KF478462.1	ON258202.1	KF478552.1
<i>Microniphargus leruthi</i>	United Kingdom	MT191446.1	MT191500.1	–	MT993560.1
<i>Niphargus longidactylus</i>	Slovenia: 46.080N;14.573E	MT191441.1	–	–	KY643583.1
<i>Morinoia japonica</i>	China: Hebei	MG655754.1	EF582999.1	MG655715.1	EF570353.1
<i>Pseudoniphargus daviui</i>	Spain	HE967300.1	–	–	LS482548.1
<i>Neogammarus rhipidophorus</i>	Italy: Sardegna, Golfo Dorgali	JF966186.1	JF965823.1	–	JF965991.1
<i>Typhlogammarus mrazeki</i>	Croatia	MK160059.1	MK159927.1	–	MK160008.1

Unless otherwise indicated, all sequence data came from individuals from the area denoted. Genbank numbers highlighted bold were produced as part of this study. Dashes indicate sequences were not available or were not from the same general region.

Table S2. Mean annual and monthly temperatures for the United States Atlantic coastline and offshore.

Locations	Mean annual	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
North of North Carolina- Onshore													
Atlantic City, NJ	13.2	4.3	3.6	5.5	9.3	13.6	18.2	20.5	22.8	22.3	17.8	12.0	7.3
Baltimore, MD	15.8	4.4	3.8	6.8	12.4	18.4	23.7	26.9	27.2	24.8	19.6	13.1	7.6
Bar Harbor, ME	8.2	2.3	0.8	1.7	4.7	8.2	11.2	13.7	14.7	13.9	12.1	9.3	5.7
Bergen Point West Reach, NY	13.6	4.1	3.2	5.3	9.7	14.7	19.9	23.4	24.3	22.2	17.2	11.6	6.9
Bishops Head, MD	16.0	4.2	4.1	8.2	15.1	19.9	25.2	27.9	27.5	24.2	17.9	10.3	6.4
Bridgeport, CT	12.5	4.3	2.0	3.7	7.3	11.9	16.4	20.2	22.3	22.7	18.1	12.3	8.1
Cape May, NJ	14.4	4.1	4.0	6.8	11.5	16.4	21.1	23.4	24.5	23.3	18.3	11.9	7.4
Chatham, Lydia Cove, MA	12.3	4.4	3.7	5.4	9.7	13.8	17.4	20.3	20.8	18.9	15.3	10.5	6.5
Chesapeake City, MD	15.5	3.1	2.7	6.7	12.8	18.9	24.9	28.2	27.7	24.3	18.1	11.3	6.9
Conimicut Light, RI	13.2	3.3	2.8	4.7	9.4	14.4	19.7	23.7	24.2	21.7	16.7	10.9	6.6
Cutler Farris Wharf, ME	8.2	5.1	3.5	3.3	4.5	6.5	8.7	10.8	12.4	12.8	12.3	10.2	7.7
Delaware City, DE	14.9	2.9	3.1	6.7	12.1	18.1	23.7	27.1	26.8	23.4	17.6	11.0	5.8
Eastport, ME	7.7	4.6	2.8	2.7	4.1	5.9	8.2	10.3	11.9	12.4	11.8	9.8	7.3
Fall River, MA	13.1	3.9	3.3	5.1	9.2	13.8	18.6	23.9	24.3	21.1	16.3	10.7	6.8
Kiptopeke, VA	16.1	5.8	5.4	8.2	12.9	18.3	23.4	26.0	26.2	24.3	19.5	13.3	8.8
Lewes, DE	14.1	4.4	4.4	6.6	10.8	15.6	20.3	22.7	23.9	22.7	17.8	11.8	7.4
Lewisetta, VA	16.0	4.4	4.2	8.1	13.8	19.4	24.6	27.5	27.3	24.1	18.3	11.9	7.2
Marcus Hook, PA	15.2	3.6	3.5	6.8	12.1	17.8	23.7	27.1	27.1	23.6	18.3	11.4	6.3
Money Point, VA	19.4	9.5	9.5	12.2	16.7	21.6	26.4	29.3	29.6	26.8	21.9	16.3	12.1
Montauk, NY	12.6	4.3	3.2	5.7	9.2	12.0	16.7	20.9	21.8	20.7	16.7	11.8	7.4
Nantucket Island, MA	13.0	2.7	2.3	4.9	10.3	15.4	20.1	23.3	23.9	21.0	15.6	10.1	5.9
Nantucket Sound	12.6	3.9	2.6	3.9	8.1	12.2	17.4	22.6	23.8	21.3	16.4	11.2	6.6
New Haven, CT	13.9	4.6	4.1	6.0	10.2	15.1	19.3	22.8	24.3	22.5	17.7	11.8	7.7
New London, CT	12.7	4.7	3.6	4.8	8.3	12.1	16.6	20.7	22.1	21.1	17.5	12.4	7.9
Newbold, PA	14.1	2.4	2.7	6.2	11.8	17.3	23.1	26.9	26.1	22.5	16.0	9.0	4.4
Newport, RI	12.0	4.1	3.2	4.2	7.6	12.1	17.1	20.3	21.1	19.7	16.2	11.3	7.2
Ocean City Inlet, MD	14.6	5.5	4.6	6.8	11.1	15.7	20.2	22.7	24.0	23.3	19.1	13.2	8.8
Philadelphia, PA	14.2	2.7	2.7	5.8	11.3	17.0	22.4	26.1	25.9	23.1	17.4	10.4	5.3
Portland, ME	9.8	4.2	3.3	4.3	6.9	10.2	13.3	15.3	16.2	15.9	12.5	9.0	6.7
Providence, RI	12.7	3.5	2.8	4.6	8.9	13.3	18.0	22.1	23.4	21.3	16.7	10.9	6.6
Quonset Point, RI	12.2	3.0	2.8	4.3	8.6	12.4	18.6	22.3	21.9	19.3	16.1	10.8	6.1
Reedy Point, DE	15.1	2.8	2.9	6.5	12.2	18.1	23.8	27.4	27.2	24.1	18.2	11.4	5.9
Sandy Hook, NJ	13.6	3.2	2.8	5.4	10.1	15.2	20.9	24.6	24.6	22.3	16.7	10.7	6.2
Sewells Point, VA	16.7	6.2	6.2	9.3	14.2	19.2	24.0	26.7	26.9	24.8	19.9	13.7	9.1
Ship John Shoal, NJ	14.7	3.4	2.6	5.9	11.7	17.4	23.2	26.1	26.3	23.5	18.4	11.4	6.3
Solomons Island, MD	16.5	6.4	5.8	8.6	13.4	18.7	23.5	26.9	27.2	24.7	19.6	13.4	8.7
The Battery, NY	13.5	4.7	3.4	5.0	8.7	13.8	18.9	22.3	23.8	22.4	18.0	12.4	7.9
Thomas Point, MD	14.8	3.3	3.0	5.9	11.3	17.2	22.7	26.2	26.4	23.7	18.3	11.9	6.5
Tolchester Beach, MD	14.7	2.8	2.7	6.4	12.2	18.1	23.7	26.7	26.4	23.3	17.3	10.8	5.6
Wachapreague, VA	16.6	5.4	5.9	9.7	14.8	19.8	24.8	27.4	27.0	24.2	18.7	12.3	8.0
Washington, DC	16.0	3.6	4.1	8.4	14.8	19.8	25.3	28.2	27.8	24.3	18.3	10.9	6.2
Woods Hole, MA	12.0	2.7	1.6	3.3	7.4	12.6	17.6	21.7	22.5	20.8	16.4	10.8	6.0
Yorktown USCG Training Center, VA	17.0	6.2	5.8	8.7	13.9	19.8	24.6	27.4	27.8	25.4	20.4	13.9	9.2
North of North Carolina- Offshore													
Boston 16 NM East of Boston, MA	11.0	5.4	3.9	3.9	6.1	10.3	14.9	18.3	19.3	17.3	13.8	10.7	7.9
Cape Cod - 9 NM North of Provincetown, MA	11.2	6.8	5.4	5.3	6.3	9.4	13.8	16.8	18.1	17.7	14.2	11.4	8.6
Delaware Bay 26 NM Southeast of Cape May, NJ	14.6	7.3	5.7	6.2	9.2	13.7	19.4	23.2	24.1	22.4	18.6	14.7	10.6
Georges Bank 170 NM East of Hyannis, MA	11.3	7.5	6.1	5.2	5.7	8.0	11.8	16.9	19.1	17.7	15.2	12.3	9.9
Gulf of Maine - 78 NM East of Portsmouth, NH	10.3	6.3	4.9	4.4	5.1	7.9	12.3	16.9	18.6	16.1	12.5	10.0	8.1
Long Island - 30 NM South of Islip, NY	13.7	7.4	5.4	5.3	7.6	11.7	17.7	22.5	23.1	21.2	17.6	13.9	10.5
Nantucket 54 NM Southeast of Nantucket	12.0	7.6	6.2	6.0	6.7	9.0	12.7	17.1	20.5	19.2	15.9	13.2	10.1
Portland - 12 NM Southeast of Portland, ME	10.0	5.3	3.9	3.6	5.5	9.1	13.2	16.2	17.4	15.7	12.6	9.8	7.3
Texas Tower #4 - 75 NM East of Long Beach, NJ	15.5	11.0	9.6	8.1	8.7	11.2	17.6	23.8	24.7	22.6	19.2	15.9	13.4
Virginia Beach 64 NM East of Virginia Beach, VA	17.1	12.1	10.4	10.2	11.2	14.6	20.5	25.3	26.1	23.7	20.3	16.6	13.8
North Carolina, north of Cape Hatteras													
Duck, NC	15.4	7.7	6.4	7.9	11.1	15.6	19.8	21.3	23.2	23.9	20.4	15.3	11.2
Oregon Inlet Marina, NC	17.4	7.3	7.5	10.9	15.8	20.3	24.5	26.8	26.6	24.4	19.9	14.2	10.2
Cape Hatteras													
USCG Station Hatteras, NC	19.3	10.3	11.3	13.6	17.6	21.8	25.6	27.3	27.4	26.1	21.7	16.1	12.8
East Hatteras - 150 NM East of Cape Hatteras	23.4	20.7	20.3	19.8	20.5	22.3	24.6	27.1	27.7	27.2	25.4	23.6	21.9
South Hatteras - 225 NM South of Cape Hatteras	24.6	21.9	21.2	21.6	22.2	24.1	26.1	27.7	28.4	27.9	26.1	24.4	23.1
North Carolina, south of Cape Hatteras													
Beaufort, Duke Marine Lab, NC	19.4	10.0	10.3	13.3	17.6	22.1	26.1	28.1	28.1	25.9	21.9	16.3	12.3
Wilmington, NC	19.2	8.4	9.3	13.3	18.3	22.7	26.6	28.6	28.4	25.8	21.6	15.8	10.8
Wrightsville Beach, NC	20.3	12.2	11.4	13.6	17.5	21.8	25.8	27.7	28.4	27.6	23.8	18.4	14.8
South of North Carolina- Onshore													
Fowey Rock, FL	26.5	23.3	23.3	23.9	25.1	26.6	28.3	29.4	29.8	29.3	27.9	26.1	24.6
Lake Worth Pier, FL (8722670)	26.6	23.6	23.8	24.2	25.4	26.7	28.1	29.3	29.8	29.4	27.8	26.1	24.8
St. Augustine, FL	22.2	15.1	15.3	17.6	20.7	24.2	26.4	27.1	27.6	28.1	25.1	21.0	17.4
Virginia Key, FL (8723214)	27.0	22.6	23.4	24.2	26.3	27.8	29.8	30.8	31.1	30.3	28.2	25.7	24.0
Charleston, Cooper River Entrance, SC	21.2	11.8	12.4	15.5	19.8	24.2	27.9	29.6	29.6	27.5	23.8	17.9	13.7
Fort Pulaski, GA	20.3	11.4	11.8	14.9	19.0	23.1	26.5	28.0	28.3	26.4	22.7	17.4	13.7
Fernandina Beach, FL	22.3	14.2	14.9	18.0	21.5	24.7	27.6	28.7	28.8	27.9	25.1	19.8	15.9
Mayport (Bar Pilots Dock), FL	22.2	14.7	14.7	17.2	20.7	24.5	27.3	28.1	28.4	28.1	25.2	20.7	16.9
Dames Point, FL	23.2	15.3	16.1	18.7	21.9	25.4	28.6	29.6	29.8	28.7	25.5	20.9	17.5
Jacksonville University, FL	23.3	15.0	16.6	19.4	22.3	25.7	28.6	29.8	29.9	28.3	25.1	20.7	17.7
Trident Pier, Port Canaveral, FL	25.2	19.2	20.5	23.6	26.1	26.4	28.0	28.1	28.5	30.4	27.1	23.3	21.1
Virginia Key, Biscayne Bay, FL	26.6	21.9	22.7	23.8	25.8	27.7	29.5	30.6	30.7	29.8	27.8	25.2	23.3
Vaca Key, Florida Bay, FL	27.3	21.7	23.1	24.8	27.1	29.1	30.9	31.7	31.8	30.8	28.3	25.1	22.9
Key West, FL	27.2	22.6	23.3	24.3	26.1	28.2	30.1	30.8	31.4	30.6	28.7	25.7	24.1
South of North Carolina- Offshore													
Edisto - 41 NM Southeast of Charleston, SC	24.0	19.9	19.4	20.0	21.2	23.6	26.4	28.3	28.6	27.7	26.3	24.2	22.3
Grays Reef - 40 NM Southeast of Savannah, GA	21.6	13.8	13.4	15.7	19.3	23.3	26.6	28.2	28.6	27.8	24.8	20.3	16.4
Canaveral 20 NM East of Cape Canaveral, FL	25.5	22.7	22.1	22.3	23.5	25.2	27.1	28.2	28.6	28.7	27.7	25.8	24.1
Canaveral East - 120NM East of Cape Canaveral	26.1	23.8	23.3	23.4	24.3	25.6	27.5	28.9	29.3	28.9	27.7	25.9	24.7

Data from NOAA NCEI Coastal Water Temperatures accessed 13 Oct 2023. Data ranges as far back as 1975 to present, and at least from 2000 to present.