



Supplement of

**Analysis of a human-mediated microbioinvasion:
the global spread of the benthic foraminifer
Trochammina hadai Uchio, 1962**

Mary McGann et al.

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Supplementary Table S1. Number of samples with *Trochammina hadai* present out of the total number of samples collected for sites along coastal western North America (Canada and the USA) and the Hawaiian Islands in 1930–2024. Data from McGann et al. (2024). Asterisk indicates specimens assumed to be displaced.

Samples with <i>Trochammina hadai</i> present/Total samples						Samples with <i>Trochammina hadai</i> present/Total samples					
Sample Location	1930-2010	2014-2016	2022	2024	All	Sample Location	1930-2010	2014-2016	2022	2024	All
Canada						Washington (continued)					
British Columbia	0/72				0/72	Semiahmoo Bay	0/3				0/3
Davis Lagoon			2/2		2/2	Sequim Bay	0/1				0/1
Deltaport Terminal, Robert's Bank	1/1				1/1	Shelton	4/4				4/4
Duke Point			0/1		0/1	Shilshole Bay	0/1				0/1
Nanaimo	1/1		1/1		2/2	Sinclair Inlet	2/8				2/8
White Rock, Semiahmoo Bay	1/1				1/1	Skagit Bay	0/3				0/3
United States						Snohomish River Delta	0/3				0/3
Alaska						South Admiralty Inlet	0/3				0/3
Prince William Sound	16/49				16/49	South Squaxin Island	0/1				0/1
Anchorage	0/15				0/15	Steilacoom Marina	0/1				0/1
Washington						Strait of Georgia	0/1				0/1
Anacortes	0/4		0/1		0/5	Strait of Juan de Fuca	0/1				0/1
Anderson Island	1/3				1/3	Tacoma	0/4				0/4
Bainbridge Island	0/6				0/6	Thea Foss Waterway	0/5				0/5
Bellingham Bay	29/39				29/39	Totten Inlet	2/3				2/3
Birch Bay	3/3				3/3	West Harbor Island	1/4				1/4
Blaine	1/1				1/1	West Point	0/4				0/4
Blair Waterway	2/3				2/3	Whidbey Island	0/1				0/1
Boundary Bay	2/7				2/7	Willapa Bay	15/20		0/3		15/23
Brownsville	0/1				0/1	Wollochet Bay	0/1				0/1
Budd Inlet	0/4				0/4	Not identified	0/13				0/13
Carr Inlet	0/3				0/3						
Case Inlet	0/3				0/3	Oregon					
Central Puget Sound	0/6				0/6	Coos Bay	0/88		1/3		1/91
Cherry Point	2/3				2/3	Newport	0/1				0/1
Clallam Bay	1/1				1/1	Tillamook Bay	0/1		0/1		0/2
Colvos Passage	0/3				0/3	Northern and Central California					
Commencement Bay	18/29				18/29	Bodega Bay	2/12				2/12
Coronet Bay	0/1				0/1	Humboldt Bay	22/24		2/3		24/27
Cowlitz Bay	1/1				1/1	Monterey Bay	0/6				0/6
Dabob Bay	0/3				0/3	Morro Bay	2/2		1/1		3/3
Discovery Bay	0/2				0/2	Moss Landing	0/3				0/3
Drayton Harbor	3/3				3/3	Pismo Beach	0/1				0/1
Drayton Passage	0/3				0/3	San Francisco Bay	332/1002	3/3		89/105	424/1110
Duwamish Waterway	3/3				3/3	Santa Cruz	0/2				0/2
Dyes Inlet	1/4				1/4	Tomales Bay	32/113				32/113
Eagle Harbor	0/3				0/3	Southern California					
East Harbor Island	0/3				0/3	Agua Hedionda Lagoon	5/5				5/5
East Passage	0/3				0/3	Alamitos Bay	2/2				2/2
Edmonds	0/1				0/1	Ballona Creek	0/2				0/2
Eld Inlet	0/3				0/3	Batiquitos Lagoon	3/5				3/5
Elliot Bay	5/32				5/32	Bolsa Chica	2/3				2/3
Everett and Port Gardner	1/14				1/14	Dana Point Harbor	4/4				4/4
Fidalgo Bay	6/6				6/6	Goleta Slough	1/1				1/1
Gig Harbor	0/3				0/3	Hueneme to Dume	0/16				0/16
Grapeview	1/1				1/1	Huntington Harbor	1/1				1/1
Grays Harbor	3/14				3/14	Los Alamitos Estuary	1/1				1/1
Hale Passage	0/2				0/2	Los Angeles River Estuary	0/1				0/1
Henderson Inlet	0/3				0/3	Los Angeles/Long Beach	33/35		1/2		34/37
Hood Canal	1/9				1/9	Los Penasquitos Lagoon	0/5				0/5
Hylebos Waterway	2/3				2/3	Marina Del Rey	5/5		0/1		5/6
Ilwaco	0/1				0/1	Mission Bay	8/9				8/9
Keyport	1/3				1/3	Mugu Lagoon	0/2				0/2
Liberty Bay	1/3				1/3	Newport Bay	9/9				9/9
Manchester	1/1				1/1	North Channel Islands	3/24				3/24
March Point	2/6				2/6	Oceanside Harbor	3/3				3/3
Maury Island	0/1				0/1	Orange Shelf	0/6				0/6
Middle Waterway	0/3				0/3	Orange Slope	0/5				0/5
Neptune Beach	1/1				1/1	Oxnard/Channel Island Harbor	2/2				2/2
North Comorant Passage	0/1				0/1	Palos Verdes Shelf	0/2				0/2
North of Dash Point	0/1				0/1	Point Hueneme	2/3				2/3
Nisqually Reach	0/3				0/3	San Diego Bay	76/122		0/1		76/123
Oak Harbor	0/3				0/3	San Diego River	2/4				2/4
Oakland Bay	2/2				2/2	San Diego Shelf	1*/26				1*/26
Olympia	0/4				0/4	San Diego Slope	0/8				0/8
Olympic Coast	0/27				0/27	San Elijo Lagoon	0/5				0/5
Orcas Island	0/7				0/7	San Gabriel River Estuary	2/2				2/2
Padilla Bay	31/51		1/1		32/52	San Pedro Channel	0/7				0/7
Penn Cove	0/3				0/3	San Pedro Shelf	1*/15				1*/15
Pickering Pass	0/2				0/2	Santa Ana River Estuary	1/1				1/1
Piner Point	0/1				0/1	Santa Barbara	2/2		1/1		3/3
Point Pully (Three Tree Point)	0/1				0/1	Santa Barbara Channel	0/45				0/45
Port Ludlow	1/3				1/3	Santa Margarita Estuary	0/5				0/5
Port Madison	1/6				1/6	Santa Monica Bay	0/14				0/14
Port Orchard	0/5				0/5	Seal Beach	1/2				1/2
Port Susan	1/3				1/3	Sweetwater River	1/5				1/5
Port Townsend	0/5				0/5	Tijuana River Estuary	0/5				0/5
Port Washington Narrows	0/3				0/3	Ventura Harbor	1/1				1/1
Possession Sound	1/7				1/7	Not identified	8/35				8/35
Quartermaster Harbor	0/3				0/3	Hawaiian Islands					
Quilcene Bay	0/2				0/2	Lanai	0/3				0/3
Rich Passage	0/3				0/3	Molokai	0/22				0/22
Samish Bay	15/22				15/22	Oahu, Honolulu	0/14				0/14
San Juan Islands	4/6				4/6	Total	761/2414	3/3	10/22	89/105	863/2544

Supplementary Table S2. Repository information for figured specimens of *Trochammina hadai*. LMM indicates light microscope micrograph; SEM indicates Scanning electron micrograph. Asterisk indicates sample destroyed during molecular analysis.

Plate	Figure number	Photographic Image	Species	Sampling locality	Repository or Responsible Agency	Sample number	Isolate, Accession number
1	1	LMM	<i>Trochammina hadai</i> , paratypes slide	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	2a	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	2b	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	2c	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	3a	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	3b	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	3c	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	4a	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	4b	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	4c	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	5a	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	5b	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	5c	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	6a	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	6b	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	6c	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	7a	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	7b	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	7c	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	8a	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	8b	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	8c	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	9a	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	9b	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	9c	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	10a	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	10b	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	10c	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	11a	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	11b	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	11c	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	12a	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	12b	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
1	12c	LMM	<i>Trochammina hadai</i> , paratype	off River Shinano, Niigata-ken, Japan	National Museum of Natural History, Washington, D.C., U.S.	Cushman Collection, 64882	
2	1a	SEM	<i>Trochammina hadai</i>	Isozaki Fishing Port, Matsushima Bay, Miyagi, Japan	Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka Kanagawa, Japan	none, image number 9704110002	
2	1b	SEM	<i>Trochammina hadai</i>	Isozaki Fishing Port, Matsushima Bay, Miyagi, Japan	Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka Kanagawa, Japan	none, image number 9704110010	
2	2a	SEM	<i>Trochammina hadai</i>	San Francisco Bay, California, U.S.	Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka Kanagawa, Japan	none, image number 9704110001	
2	2b	SEM	<i>Trochammina hadai</i>	San Francisco Bay, California, U.S.	Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka Kanagawa, Japan	none, image number 9704110009	
2	3a	SEM	<i>Trochammina hadai</i>	Leschenault Inlet, Western Australia	University of Western Australia Earth Science Museum	UWA181315	
2	3b	SEM	<i>Trochammina hadai</i>	Collie River, Western Australia	University of Western Australia Earth Science Museum	UWA181332	
2	4a	SEM	<i>Trochammina hadai</i>	Le Havre Harbor, France	UMR8187 Laboratoire d'Océanologie et de Géosciences, Station Marine de Wimereux, France	H1	
2	4b	SEM	<i>Trochammina hadai</i>	Le Havre Harbor, France	UMR8187 Laboratoire d'Océanologie et de Géosciences, Station Marine de Wimereux, France	H1	
2	5a	SEM	<i>Trochammina hadai</i>	Hinsholm Harbour, Gothenburg, Sweden	Gothenburg Natural History Museum	HIN12	Protista/Protozoa Catalogue, number GNM Prot. 94
2	5b	SEM	<i>Trochammina hadai</i>	Hinsholm Harbour, Gothenburg, Sweden	Gothenburg Natural History Museum	HIN12	Protista/Protozoa Catalogue, number GNM Prot. 94
2	6a	SEM	<i>Trochammina hadai</i>	Flamengo Inlet, Brazil	Marine Geology and Geophysics and Environmental Monitoring, Federal University of Rio Grande do Norte, Natal, RN, Brazil	September 2014, Station 4	
2	6b	SEM	<i>Trochammina hadai</i>	Flamengo Inlet, Brazil	Marine Geology and Geophysics and Environmental Monitoring, Federal University of Rio Grande do Norte, Natal, RN, Brazil	September 2014, Station 4	
3	1a	LMM	<i>Trochammina hadai</i>	Isoshima, Matsushima Bay, Miyagi, Japan	Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka Kanagawa, Japan	none, image number 2012030007d	
3	1b	LMM	<i>Trochammina hadai</i>	Isoshima, Matsushima Bay, Miyagi, Japan	Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka Kanagawa, Japan	none, image number 2012030007v	
3	2a	LMM	<i>Trochammina hadai</i>	Isoshima, Matsushima Bay, Miyagi, Japan	Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka Kanagawa, Japan	none, image number 2012030009d	
3	2b	LMM	<i>Trochammina hadai</i>	Isoshima, Matsushima Bay, Miyagi, Japan	Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Yokosuka Kanagawa, Japan	none, image number 2012030009v	
3	3a	LMM	<i>Trochammina hadai</i>	Collie River, Western Australia	University of Western Australia Earth Science Museum	UWA181333	

Plate	Figure number	Photographic Image	Species	Sampling locality	Repository or Responsible Agency	Sample number	Isolate, Accession number
3	3b	LMM	<i>Trochammina hadai</i>	Collie River, Western Australia	University of Western Australia Earth Science Museum	UWA181333	
3	4a	LMM	<i>Trochammina hadai</i>	Le Havre Harbor, France	UMR8187 Laboratoire d'Océanologie et de Géosciences, Station Marine de Wimereux, France	H1	
3	4b	LMM	<i>Trochammina hadai</i>	Le Havre Harbor, France	UMR8187 Laboratoire d'Océanologie et de Géosciences, Station Marine de Wimereux, France	H1	
3	5a	LMM	<i>Trochammina hadai</i>	Hinsholm Harbour, Gothenburg, Sweden	Department of Genetics and Evolution, The University of Geneva, Geneva, Switzerland	HIN12	22014, OR428346*
3	5b	LMM	<i>Trochammina hadai</i>	Hinsholm Harbour, Gothenburg, Sweden	Department of Genetics and Evolution, The University of Geneva, Geneva, Switzerland	HIN12	22016
3	6a	LMM	<i>Trochammina hadai</i>	Flamengo Inlet, Brazil	Marine Geology and Geophysics and Environmental Monitoring, Federal University of Rio Grande do Norte, Natal, RN, Brazil	March 2015, Station 15	
3	6b	LMM	<i>Trochammina hadai</i>	Flamengo Inlet, Brazil	Marine Geology and Geophysics and Environmental Monitoring, Federal University of Rio Grande do Norte, Natal, RN, Brazil	March 2015, Station 15	
3	7a	LMM	<i>Trochammina hadai</i>	Paranaguá Bay, Brazil	Laboratory of Foraminifera and Environmental Micropaleontology, Federal University of Paraná/Museum of Natural Sciences, Brazil	none	
3	7b	LMM	<i>Trochammina hadai</i>	Paranaguá Bay, Brazil	Laboratory of Foraminifera and Environmental Micropaleontology, Federal University of Paraná/Museum of Natural Sciences, Brazil	none	
3	8a	LMM	<i>Trochammina hadai</i>	Paranaguá Bay, Brazil	Laboratory of Foraminifera and Environmental Micropaleontology, Federal University of Paraná/Museum of Natural Sciences, Brazil	none	
3	8b	LMM	<i>Trochammina hadai</i>	Paranaguá Bay, Brazil	Laboratory of Foraminifera and Environmental Micropaleontology, Federal University of Paraná/Museum of Natural Sciences, Brazil	none	
4	1	LMM	<i>Trochammina hadai</i>	Nanaimo Harbour, British Columbia, Canada	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	2022-625-FA, Station 2022-625-1	
4	2	LMM	<i>Trochammina hadai</i>	Davis Lagoon, British Columbia, Canada	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	2022-625-FA, Station 2022-625-3	
4	3	LMM	<i>Trochammina hadai</i>	Padilla Bay, Washington, U.S.	Department of Genetics and Evolution, The University of Geneva, Geneva, Switzerland	?W-1-04-PS, Padilla V2, 3-5 cm	21572, OP288021*
4	4	LMM	<i>Trochammina hadai</i>	Willapa Bay, Washington, U.S.	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	2022-625-FA, Station 2022-625-7	
4	5	LMM	<i>Trochammina hadai</i>	Coos Bay, Oregon, U.S.	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	2022-625-FA, Station 2022-625-12	
4	6	LMM	<i>Trochammina hadai</i>	Humboldt Bay, California, U.S.	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	1994-605-FA, Station F-1.4b	
4	7	LMM	<i>Trochammina hadai</i>	Bodega Bay, California, U.S.	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	1997-609-FA, Station BH-12	
4	8	LMM	<i>Trochammina hadai</i>	Tomales Bay, California, U.S.	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	F1-05-TB, Station 19	
4	9	LMM	<i>Trochammina hadai</i>	San Francisco Bay, California, U.S.	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	S-8-10-SF, Station SBP10	
4	10	LMM	<i>Trochammina hadai</i>	Morro Bay, California, U.S.	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	2022-625-FA, Station 2022-625-22	
4	11	LMM	<i>Trochammina hadai</i>	Santa Barbara, California, U.S.	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	2022-625-FA, Station 2022-625-19	
4	12	LMM	<i>Trochammina hadai</i>	Marina Del Rey, California, U.S.	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	1997-609-FA, Station 97-MDR-1	
4	13	LMM	<i>Trochammina hadai</i>	Los Angeles/Long Beach, California, U.S.	Department of Genetics and Evolution, The University of Geneva, Geneva, Switzerland	?1997-609-FA, 97-LA-1	21581
4	14	LMM	<i>Trochammina hadai</i>	Newport Beach, California, U.S.	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	1997-609-FA, Station 97-NB-1	
4	15	LMM	<i>Trochammina hadai</i>	Mission Bay, California, U.S.	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	1997-609-FA Station 97-MB-1	
4	16	LMM	<i>Trochammina hadai</i>	San Diego Bay, California, U.S.	U.S. Geological Survey, Pacific Coastal and Marine Science Center, Santa Cruz, California, U.S.	1998-614-FA, Station 98-SD-22	