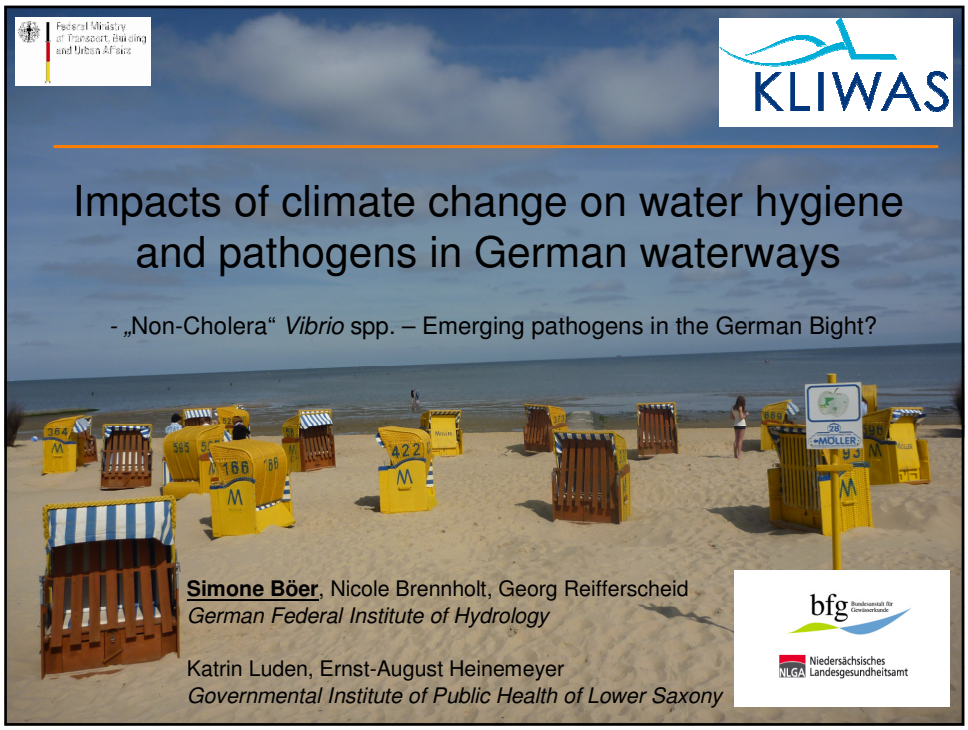

Vibrio spp. occurrence and disease

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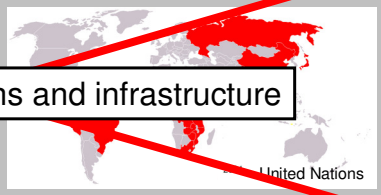
Fecal contamination of water:

- *V. cholerae* O:1, O:139
- Cholera (
- Ingestion of contaminated water
- UN; Zimbabwe August ´08 until May ´09 97,079 infected people, 4230 deaths

Good sanitary conditions and infrastructure



Natural occurrence in the marine environment:

- e.g. *V. parahaemolyticus*: most common causative organism of diarrheal infections in Southeast Asia (China 31%, Japan 20-30%, Taiwan 69%); 4500 reports in the USA
- e.g. *V. vulnificus*: 1998-2007, 900 reported cases in the USA

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Possible routes of transmission

Consumption of raw or half-cooked seafood (fish, mussels, lobster, shrimp…)

→ Gastroenteritis, primary septicemia

Fish processing/ bathing and wading in sea water in the presence of skin lesions and open wounds

→ Wound infections, ear and eye infections, necrosis, sepsis

Risk factors:
- chronic diseases
- higher age

Vibrio spp. infections after water contact in Northern Europe

Year	Country	*Vibrio* spp.	No. of cases	Presumptive source of infection	Agent identified in presumptive source?
1994	Germany	*V. vulnificus*	1	Baltic Sea	not specified
	Denmark	*V. vulnificus*	11	Sea water	not specified
	Sweden	*V. vulnificus*	1	Baltic Sea	not specified
2002	Germany	*V. vulnificus*	1	Baltic Sea	not specified
2003	Germany	*V. vulnificus*	2	Baltic Sea	yes
2004	Sweden	*V. cholerae non-O1/non-O139*	1	Baltic Sea water	not specified
2006	Germany	*V. vulnificus*	3	Baltic Sea	yes
	Denmark	*V. alginolyticus* *V. parahaemolyticus* *V. vulnificus*	7 7 1	Baltic Sea	yes
	Sweden	*V. cholerae non-O1/non-O139*	3	Baltic Sea	yes
	Poland	*V. cholerae non-O1/non-O139*	2	Inland lake Old fountain	yes no
	The Netherlands	*V. alginolyticus*	3	North Sea	yes
2008	Germany	*V. vulnificus* *V. alginolyticus/* *V. parahaemolyticus*	1 1	Baltic Sea	yes
2010	Germany	*V. vulnificus/* *V. alginolyticus/* *V. parahaemolyticus*	5	Baltic Sea	yes

Vibrio-monitoring in the German North Sea

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Research questions

- Do potentially pathogenic *Vibrio* spp. occur at bathing sites along the North Sea coast and within the adjacent estuaries?
- How does the occurrence and abundance of potentially pathogenic *Vibrio* spp. relate to temperature?
- Are there „hot spots“ of *Vibrio* spp. occurrence?

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Study area

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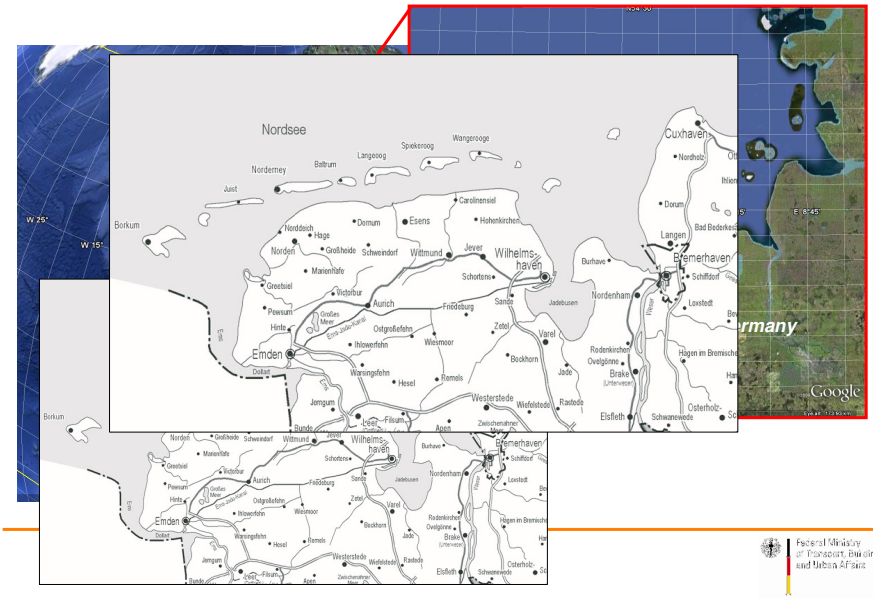

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Study area

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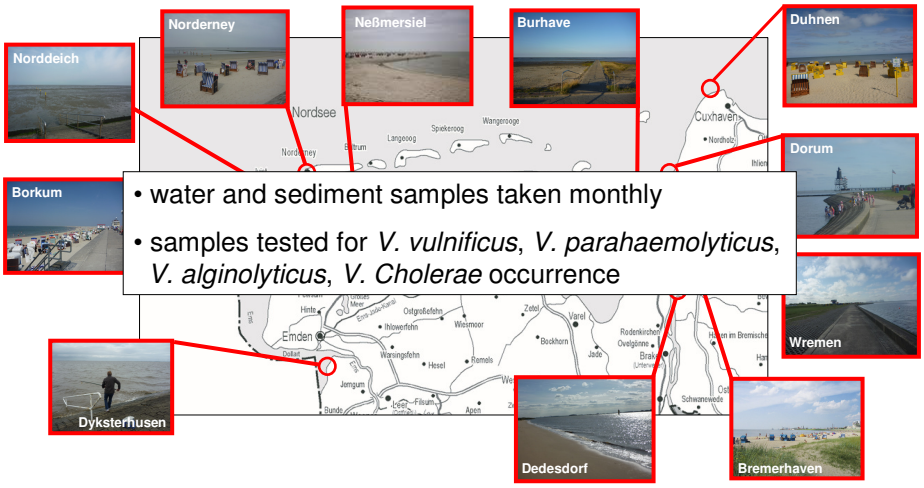

- water and sediment samples taken monthly
- samples tested for *V. vulnificus*, *V. parahaemolyticus*, *V. alginolyticus*, *V. Cholerae* occurrence

Effect of temperature on *V. alginolyticus* & *V. parahaemolyticus* occurrence

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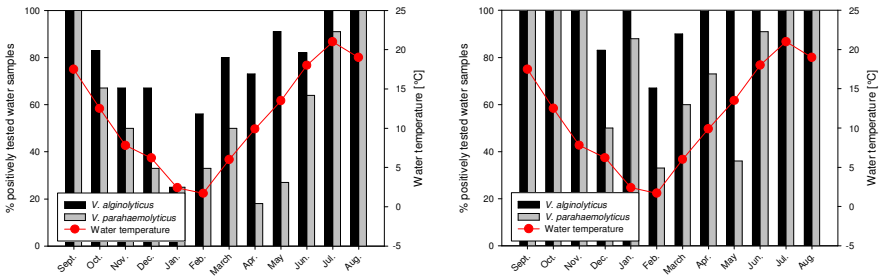
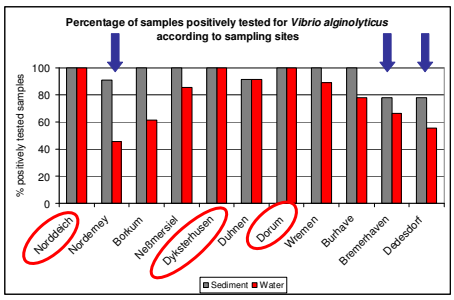
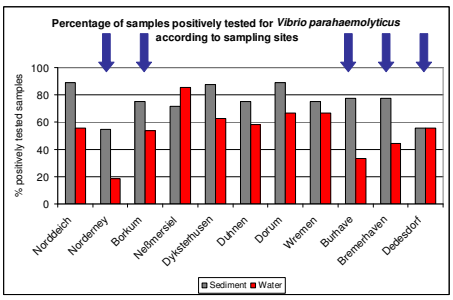


- *V. alginolyticus* and *V. parahaemolyticus* more frequently found at high temperatures than at low temperatures
- Temperature effect stronger on *V. parahaemolyticus* than on *V. alginolyticus*
- Temperature effect stronger in water than in sediments

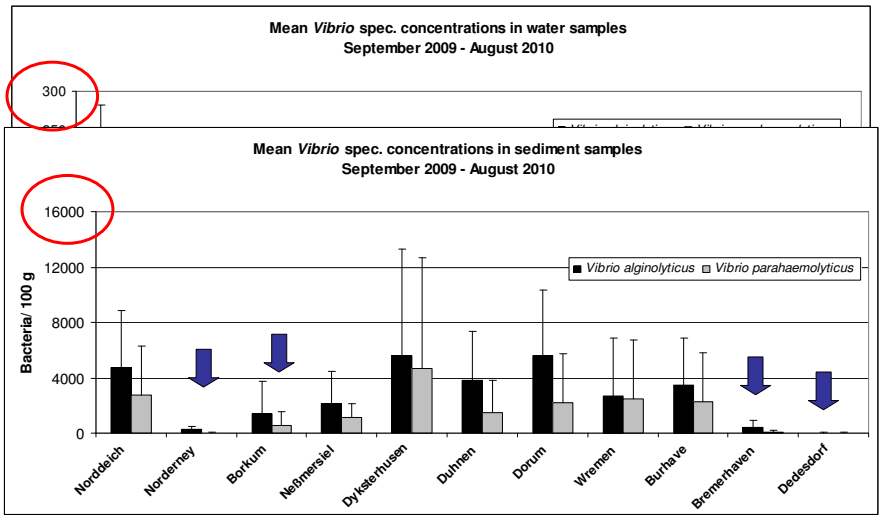
Positive *V. alginolyticus* & *V. parahaemolyticus* proofs



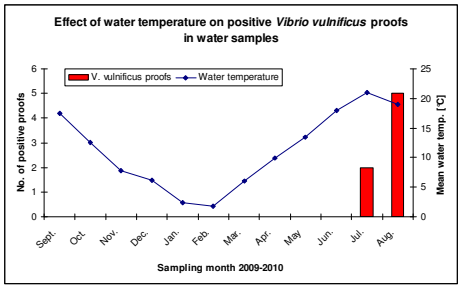


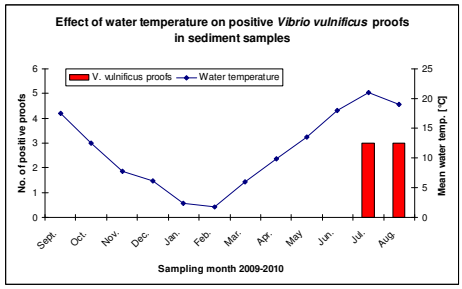
- *V. alginolyticus* more frequently found than *V. parahaemolyticus*
- *V. alginolyticus* and *V. parahaemolyticus* more frequently found in sediment samples than in water samples
- lower frequency (and abundances) at sites strongly influenced by fresh or offshore waters

Positive *V. alginolyticus* & *V. parahaemolyticus* proofs



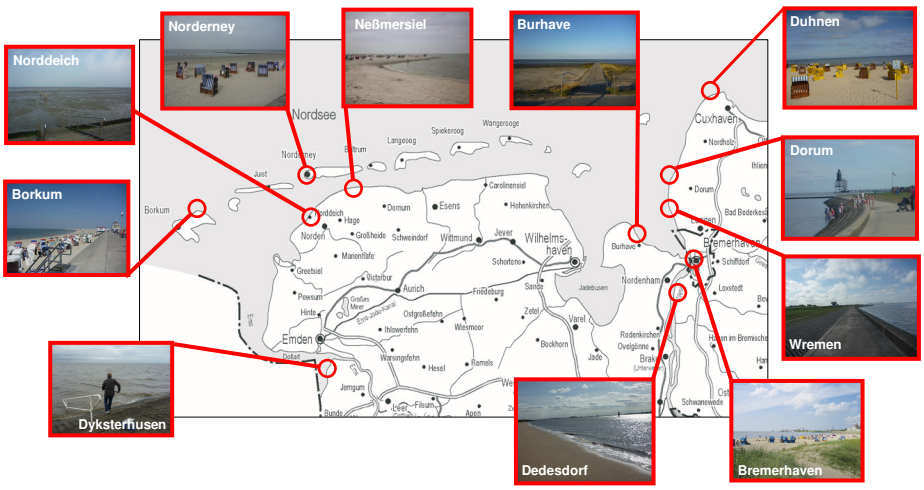
Effect of water temperature on *V. vulnificus* occurrence



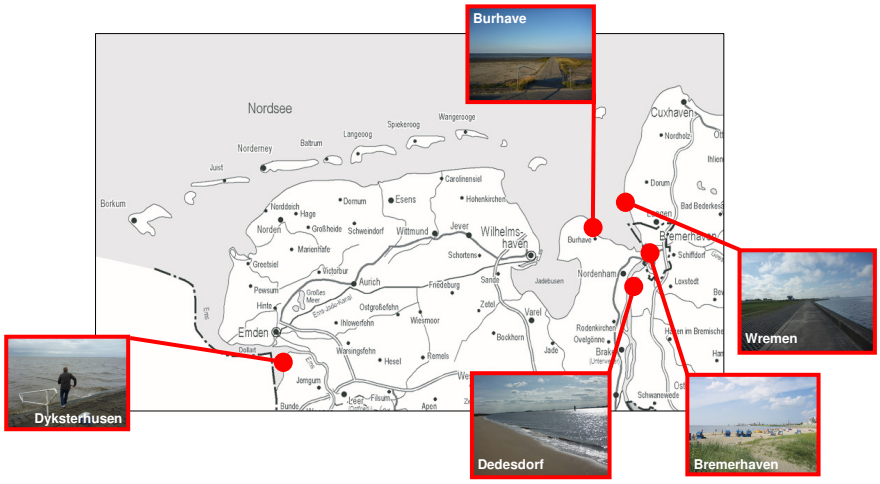


- Positive *Vibrio vulnificus* proofs only at water temperatures ~20°C

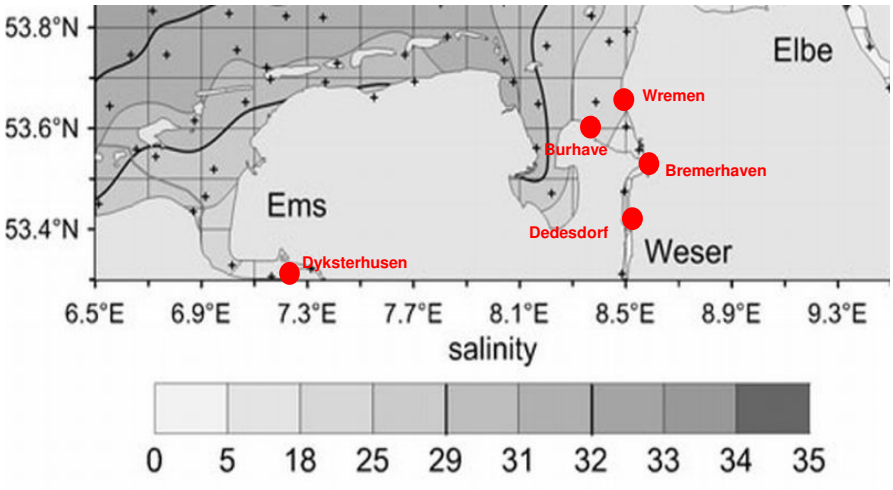
V. vulnificus „hot-spots“



V. vulnificus „hot-spots“

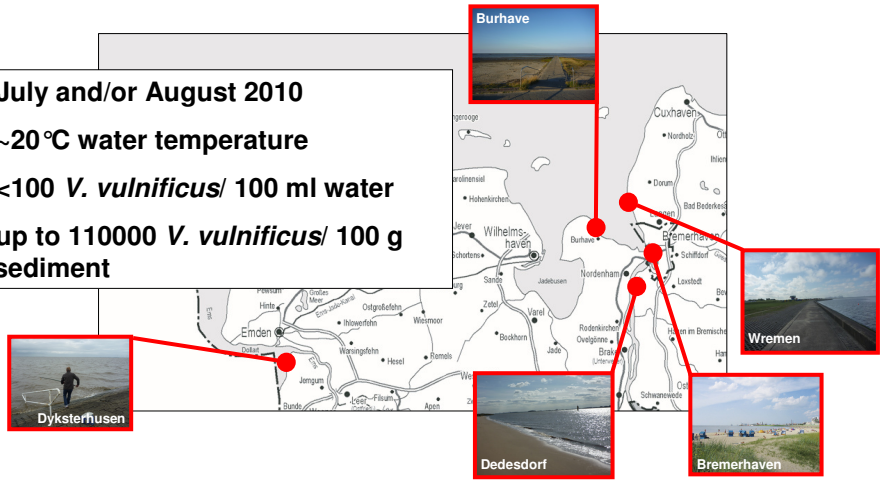


Effect of salinity on *V. vulnificus* occurrence



V. vulnificus „hot-spots“

- **July and/or August 2010**
- **~20 °C water temperature**
- **<100 *V. vulnificus*/ 100 ml water**
- **up to 110000 *V. vulnificus*/ 100 g sediment**



Summary

- *V.alginolyticus* and *V. parahaemolyticus* found at all 11 sampling sites at all seasons
- *V. alginolyticus* > *V. parahaemolyticus*
- *V. alginolyticus*/ *V. parahaemolyticus* highest at intermediate salinities
- *V. vulnificus* only found at estuarine sites at temperatures ~20 °C
- abundancies: sediments > water

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Departmental Research Programme
- National Meteorological Service of Germany (DWD)
- German Maritime and Hydrographic Agency (BSH)
- German Federal Institute of Hydrology (BfG)
- German Federal Waterways Engineering and Research Institute (BAW)

Thank you for your attention!

www.kliwas.de

bfg Bundesanstalt für Gewässerkunde

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Characteristics of pathogenic *Vibrio* spp. in the marine environment

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***Vibrio* spp. that are potentially pathogenic to humans:**

- Family: Vibrionaceae
- Genus: Vibrio
- Gram-negative, curved rod-shape
- Facultative anaerobe, halophilic
- Natural part of marine bacterial communities
- Salt water (Sea water, coastal waters, estuaries, saline inland lakes
- Sediment, plankton
- Marine fish and crustaceans

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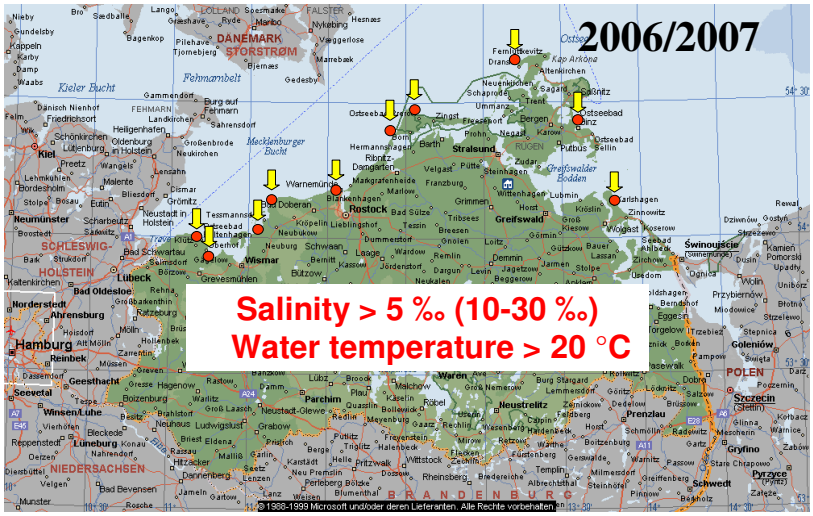
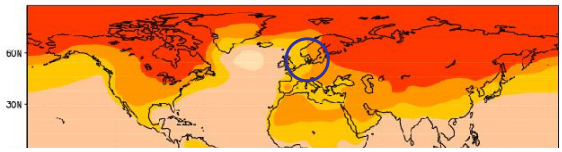
V. vulnificus occurrence at the German Baltic Sea coast

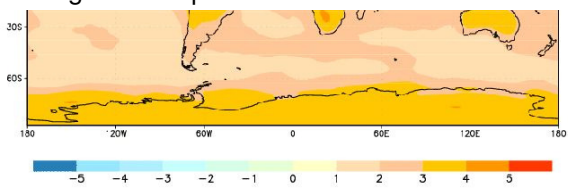


Global warming

1.4 °C water temperature increase in the North Sea and Baltic Sea between 1985-2000 (MacKenzie & Schiedek 2007)



Expected global temperature increase until 2100: 1-6 °C



Regional change of the yearly mean temperature for the period 2071-2100 compared to 1961-1990 according to IPCC scenario A2. Source: Climate Change 2007, Working Group I: The Science of Climate Change, Summary for Policymakers

Worldwide growing importance of *Vibrio* spp. infections

Hsueh et al. 2004. Emerging Infectious Diseases. Vol. 10. No. 8. 1363-1368

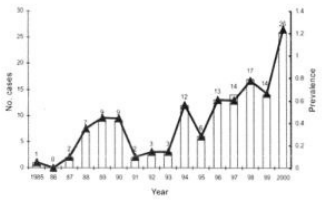


Figure 1. Estimated prevalence (per 10^5 population) and annual number of cases of *Vibrio vulnificus* infection reported from 1985 to 2000 in Taiwan. The line and triangles represent the prevalence and the bars the number of cases.

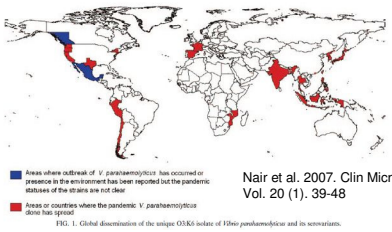


FIG. 1. Global dissemination of the unique O3:K6 isolate of *Vibrio parahaemolyticus* and its serovariants.

Nair et al. 2007. Clin Microbiol Rev. Vol. 20 (1). 39-48

1. **Increasing global trade of fishing products and seafood** due to growing demand (increasing distribution of contaminated seafood)
2. **Global warming** (increase in the abundance of *Vibrio* spp. that are potentially pathogenic to humans in coastal waters and marine organisms)