Potential for Food-borne Illness Caused by Bird Waste

Regulatory agencies have become concerned of the potential for waste from birds roosted on floating shellfish aquaculture gear to contaminate the shellfish contained in the gear. With a recent report of human illnesses from *Campylobacter* tied to consumption of cultured oysters, this concern is likely to grow. Cape Cod Cooperative Extension has been working with a Master of Public Health student to better understand the risk from birds roosted on floating gear, in hopes solutions can be found. The information provided in this fact sheet is based on a review of scientific articles on the topic of the food safety impact that bird waste may have on shellfish production.

Wild Birds and Bacteria

Birds can carry *Campylobacter* spp., *Salmonella* spp., *Listeria, E. coli, Vibrio cholerae, Aeromonas* spp., and *Enterococcus* spp. in their digestive tract (1, 7, 8, 11, 12, 16, 17, 24, 30).

Although gulls are common hosts of *Salmonella* it's not likely to be a commensal organism.The levels in gulls have mirrored the levels in human population, indicating exposure through forage *(6, 19)*.

Gulls are the most commonly documented carriers of *Campylobacter* and *Salmonella*;they have been found to maintain weights and body condition within normal range (15, 23).

The amount and or type of pathogenic bacteria depends on the bird's diet and bird abundance *(4, 15, 23)*.

Birds that forage near garbage and/or sewage will have higher pathogenic bacterial counts *(Salmonella and Campylobacter)* (23).

Listeria has not been found in oysters (20, 25).

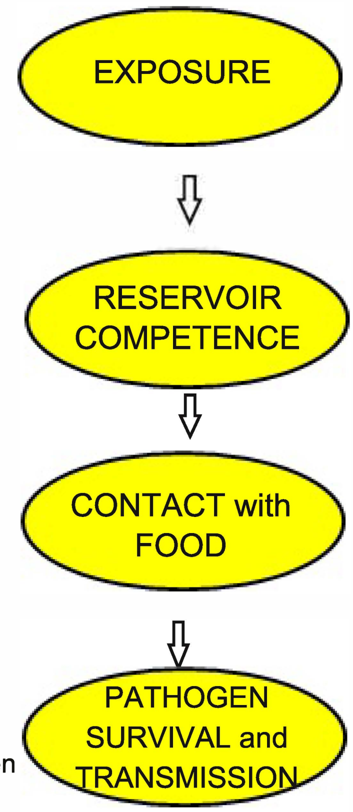


Figure 1 Flowchart depicting the transmission of a pathogen from a wild bird reservoir to a person.

Figure 2 Photo of birds roosting on floating aquaculture gear at a shellfish farm without a deterrent system in place (36).

Figure 3 Photo of floating aquaculture gear with one type of a bird deterring scare kite in place at a shellfish farm (36).

Campylobacter in Wild Birds

Campylobacter jejuni & *lari* are the species commonly associated with birds (33, 34) and wild birds (gulls, corvids) and poultry are natural reservoirs of *Campylobacter jejuni* (5, 10, 14, 31).
A single bird can harbor more than one species of *Campylobacter* (34), and most of the *Campylobacter* species identified in birds were not human pathogens (13).
Campylobacter has been found to become more pathogenic to people after passing through a bird's digestive tract (5).

Campylobacter in the Environment

E. coli water quality test results tend to have a low correlation with *Campylobacter* concentration (33).
Campylobacter has been found to survive in many environments and has been known to: mutate to adapt to harsh conditions leading to strain variability (10, 18), survive in salt water, and has been found in a salinity range of 27-35ppt in a marine estuary (18, 35).
C. lari can survive longer in seawater than other *Campylobacter* species and may survive in saltier water than *C. jejuni* (18).
Campylobacter survives in and on amoeba and algae in water (3).
It's ideal temperature range for growth is 37-42 °C (10).
It survives in cold, slow moving, low oxygen water (18, 28).
In estuaries, it has been found to survive up to 14 days in the water column and 21 days in the bank and sediment (28, 29).
Maintained in 4 °C water (refrigerator), it can survive up to four weeks (2, 26).
It's inactivated completely at degrees above 52 °C (27, 32).
C. lari tolerates lower temperatures than other *Campylobacter* species (18).
A seasonal variation in occurrance has not been not identified (30).

Figure 4 Pleasant Bay Orleans, MA water temperature and salinity (37).

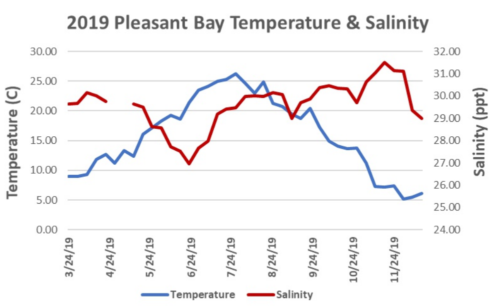
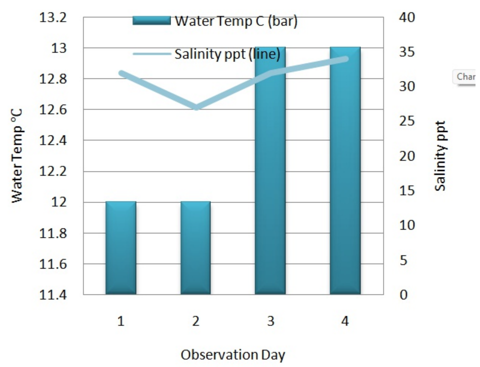


Figure 5 Adapted from Lozano-Leon, 2021, estuary conditions with *Campylobacter* detected (18).



Campylobacter in People

Campylobacteriosis is the most commonly reported cause of food borne illness in the US and worldwide.
The amount of *C. jejuni* needed to be ingested to become infected is very low, only 500 active bacteria (21).
Dose of *C. lari* per portion of raw oyster has been found to range from 1-25 cfu (32).
Low infectious dose and a not completely effective depuration process leads to the potential for illness in people (35).
Degree of illness is dependent upon the strength of the *Campylobacter* strain and the susceptibility of the infected person (5, 21).
Can cause sudden diarrhea watery, sometimes bloody, painful cramps, other gastrointestinal symptoms, temporary paralysis, arthritis, inflammatory bowel disease, sepsis, and in extreme cases, death (5, 9, 21,31).

The information in this fact sheet has been compiled by Tonya Hadjis, DVM, with the support of the Cape Cod Cooperative Extension.

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36. Photos of floating gear used with permission.
37. Pleasant Bay temperature and salinity chart taken from Cape Cod Cooperative Extension.