

Risk assessment – fish parasites (T. Dick)

Most of the 24 parasite species identified from Devils Lake have been identified downstream. The exceptions are *Epistylis* sp. and Gyroporhynchidae which have not been identified downstream of Devils Lake. However a closely related protozoan genera, *Caprinia* sp., has been identified from fish in the Red River estuary. The leech, *Myzobdella lugubris*, was not identified from the Red River estuary but the genus is common in the Hudson Bay drainage.

The assessment is based on the known distribution of these organisms on both sides of the USA/Canada border and the potential for transfer.

I. Based on life history and life cycles. Ranking 1-3

Protozoa

Ciliophora:

- | | |
|-----------------------|--|
| <i>Epistylis</i> sp. | Transfer by water and infected fish. Rank 3. |
| <i>Apiosoma</i> sp. | Transfer by water and infected fish. Rank 3. |
| <i>Trichodina</i> sp. | Transfer by water and infected fish. Rank 3. |

Myxozoa:

- | | |
|----------------------|--|
| <i>Myxobolus</i> sp. | Transfer by water and infected fish. Rank 3. |
| <i>Unicauda</i> sp. | Transfer by water and infected fish. Rank 3. |

Platyhelminthes

Mongenean

- | | |
|------------------------------|-----------------------------------|
| <i>Onchocleidus chrysops</i> | Transfer by infected fish. Rank 3 |
| <i>Gyrodactylus hoffmani</i> | Transfer by infected fish. Rank 3 |
| <i>Gyrodactylus</i> sp. | Transfer by infected fish. Rank 3 |

Digenean Trematodes+

- | | |
|------------------------------------|--|
| <i>Neascus</i> , | Transfer by infected fish and bird hosts. Rank 3 |
| <i>Diplostomum</i> sp. | Transfer by infected fish and bird hosts. Rank 3 |
| <i>Diplostomum spathaceum</i> | Transfer by infected fish and bird hosts. Rank 3 |
| <i>Posthodiplostomum</i> (Neascus) | Transfer by infected fish and bird hosts. Rank 3 |

+ Possible transfer by water and or infected invertebrate hosts

Cestodes

<i>Bothriocephalus cuspidatus</i>	Transfer by infected invertebrate and fish hosts. Rank 3
<i>Bothriocephalus</i> sp.	Transfer by infected invertebrate and fish hosts. Rank 3
<i>Proteocephalus pinguis</i>	Transfer by infected invertebrate and fish hosts. Rank 3
<i>Proteocephalus</i> sp.	Transfer by infected invertebrate and fish hosts. Rank 3
<i>Ligula intestinalis</i>	Transfer by infected invertebrate, fish and bird hosts. Rank 3

Nematoda

<i>Spiroxys</i> sp.	Transfer by infected invertebrate and fish hosts. Rank 3
<i>Rhabdochona</i> sp.	Transfer by infected invertebrate and fish hosts. Rank 3
<i>Rapidascaris acus</i>	Transfer by infected invertebrate and fish hosts. Rank 3
<i>Raphidascaris</i> sp.	Transfer by infected invertebrate and fish hosts. Rank 3
<i>Contracaecum</i> sp.	Transfer by infected invertebrate, fish and bird hosts. Rank 3

Gryporynchidae**Leeches**

<i>Myzobdella lugubris</i>	Transfer by water and on infected fish. Rank 3
----------------------------	--

II. Disease outbreaks

The usually causes for a disease outbreak are changes in the environment that end up stressing fish. These stressors include high or low temperatures depending on the optimum temperature of a fish species, insufficient food, low oxygen levels and pollution (toxic compounds and fertilizers) and low water levels and flows. A nutrient rich environment that supports population growth of the intermediate invertebrate hosts may increase the number of infective stage of parasites like *Bothriocephalus*, *Proteocephalus*, *Ligula*, High densities of fish will also increase the opportunity for direct transfer of parasites such as protozoa and ectoparasites such as the monogenean parasites, *Gyrodactylus hoffmani*, and leeches.

Ideal conditions for birds to overnight during migration may result in "seeding" a local water body with infective stages such as the nematode, *Contracaecum* sp. and trematode *Neascus*. Bird nesting and rearing areas throughout the summer will usually result in an increase in bird transmitted parasites such as (*Neascus*, *Diplostomum*, *Ligula* etc.). This

is usually more pronounced in small shallow lakes. Stocking an exotic fish species or a new species invasion by a parasite, invertebrate or fish host (s) can modify a local food web and change the population dynamics, including predator prey interactions, which might lead to a disease outbreak.

III. Risk of transferring Devil Lake parasite elsewhere in the Basin

Risk to downstream fish and fisheries: Assuming similar patterns of climatic conditions and species invasions over the last two decades the **risk is ranked at 1.**

Likelihood of causing disease: Assuming similar patterns of climatic conditions and species invasions over the last two decades the **risk is ranked at 1.**

Note: The species invasion by cestode, *Bothriocephalus acheilognathi*, into Lake Winnipeg, Manitoba raises concerns, even if the route of entry to Lake Winnipeg is still speculative. It is an example that species invasions are occurring and makes a compelling argument for a well planned monitoring program in transboundary waters, at some level, into the future.

IV. Geographical distribution:

Protozoa

Trichodina sp. **(Rank abundant)**

ND, Man., China, Europe, Russia, South Africa, VA, Ont., WV, IL.

Comment: Influenced by environmental factors rather than fish density.

Apiosoma sp. **(Rank abundant)**

ND, WV, Ont., UT, B.C., South Africa, many undescribed species in North America.

Comment: Many species described in Europe, some considered harmful.

Epistylis sp. **(Rank abundant)**

ND, BC, Ont., YT, Japan, SC, NH, CA, MI, VA, AR, NC.

Comment: Causes red sore, may be secondary to bacteria (*Aeromonas*) infection, may contribute to morbidity by smothering the gills.

Myxobolus sp. **(Rank abundant)**

ND, Man., Japan, Europe, Russia, Ont., East NY, IA, NC, MD, PA, Que., , IL, Germany, OK, NS, IA, China, MT, Lake Michigan, Spain, ND, SC, CA, WA, Asia, OR, Man., ND, PA, KY.

Comment: Acute phase conspicuous hemorrhage areas present at base of scales (*M. notemigoni*) from AR (many cases) in Arkansas.

Unicauda sp. (**Rank abundant**)
ND, Que., Lake Erie, TX, MT, , BC, NJ, WV,

Monogenean

Onchocleidus chrysops. (**Rank common***)
ND, Man., WI, Ont.

Gyrodactylus hoffmani. (**Rank common***)
ND, Man., Ont., FL

Gyrodactylus sp. (**Rank Abundant**)
(world wide)

Digean Trematodes:

Neascus. (**Rank abundant**)
Wide distribution in North America, ND, MN, MA,

Diplostomum sp. (Diplosomulum). (**Rank abundant**)
ND, Man., Ont. FL, TX, Sask. SD, AR, MI, WI, great Lakes, OH, ID, WY,
Europe

Diplostomum spathaceum. (**Rank abundant**)
Northern Hemisphere, Denmark, Russia, Spain, ND, Man., ND, Ont. MI, MN,
SD, MA, CA, IL, IA.
Comment: Some small fish killed and older fish permanently blinded

Posthodiplostomum (*Neascus*). (**Rank common**)
ND, AL, NC, Mexico

Cestodes:

Bothriocephalus cuspidatus. (**Rank abundant**)
ND, Man. AR, ID, IL, KY, ME, MI, NT, OR, PA, SD, WA, WI, WV, Ont. Que.

Bothriocephalus sp. (**Rank abundant**)
(world wide)

Proteocephalus pinguis. (**Rank abundant**)
ND, Man., North America, WI, CO, IA, ME, MN, NY, Alberta, Que. Ont.

Proteocephalus sp. (**Rank abundant**)
(world wide)

Ligula intestinalis. (**Rank abundant**)

North America, England, New Zealand.

Comment: Causes damage in small fish and a reduction or loss of gonads

Nematoda

Spiroxys sp. (**Rank common**)

ND, PA, OH, WI, BC, Ont., CA,

Rapidascaris acus. (**Rank abundant**)

ND, Man. North America, Russia, England, Canada, Europe, NY, Italy

Rhabdochona sp. (**Rank abundant**)

ND, Man. Alberta, Lake Huron, ME, PA, ND, BC, Ont., NY, MD., TX, WI. WA, CA, MI, MT, GA,

Contracaecum sp. (**Rank abundant**)

ND, Man. FL, TX, OK, KS, TN, CA, TN, Lots of Canadian records (east to west)

Leeches

Myzobdella lugubris. (**Rank abundant**)

ND, (wide distribution in North America).

Comment: Occasionally causes severe lesions on cultured catfish

* The number of locations listed for a parasite species is likely a reflection of the number of studies published and not its actual distribution.