
PHASE 2 Technical Memorandum for Red and Assiniboine Ammonia Criteria Study

From: S. Davies
Task Leader, Fish Populations Workstream

To: City of Winnipeg Project Management Committee
Study Team Members

Subject: **Fish Population Technical Memorandum # FP 01**

Title: **THE OCCURRENCE OF EXTERNAL DEFORMITIES, EROSION,
LESIONS, AND TUMOURS (DELTS) ON FISH FROM THE RED
AND ASSINIBOINE RIVERS, 1999**

Prepared by: M. Cooley and S. Davies

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1.0

INTRODUCTION

Fish distribution, abundance, and health are dependent upon the quality and quantity of available habitat. In turn, the quality and quantity of fish habitat are determined by a variety of physical (e.g., substrate composition, water depth, water velocity, turbidity, water temperature, and riparian conditions), chemical (e.g., dissolved oxygen, pH, and ammonia concentrations), and/or biological (e.g., benthic invertebrate community abundance and composition) factors.

The occurrence of external anomalies on fish inhabiting freshwater, estuarine, and marine environments of varying levels of pollution has been widely reported (Couch 1985, Lawler 1961, Moore and Hixson 1977, Slooff 1982, Van Banning 1987, Van Den Avyle et al. 1989, Vethaak and ap Rheinallt 1992). Disease and anomalies have also been experimentally induced or observed in fish exposed to a variety of contaminants in the laboratory (e.g., Weis and Weis 1976).

Fish disease is a complex response to environmental stress, whose origins may be anthropogenic (man-made) or natural. There are a number of physical, chemical, and biological factors that influence the occurrence and severity of disease in fish, either directly or indirectly (Table 1). Among these is the presence of chemical contaminants, such as ammonia. Contaminants may act directly or indirectly upon an individual to produce an anomaly (Figure 1). Unfortunately, demonstrating direct cause-and-effect relationships between contaminants and the occurrence of fish anomalies and disease is difficult. The most common method of associating fish health, as determined from external examination, with physical, chemical, and biological factors is to demonstrate elevated frequencies of anomalies and disease in fish residing in less than pristine habitats relative to those residing in more pristine systems or less impacted areas of the same system.

The routine inclusion of fish health bioindicators, including measurements of abnormalities, disease, and parasitism, during fish population assessments was advocated over a decade ago (Willford 1988). The frequency of anomalies in feral fish has been used as a reliable and sensitive indicator of the quality of the aquatic environment (e.g., Fournie et al. 1996, Karr et al. 1986, Sanders et al. 1999, Sindermann 1979) as a substantive volume of literature exists in which fish anomalies have been related to chemical contamination of the

aquatic environment (e.g., Fournie et al. 1996, Leadley et al. 1998, McCain et al. 1992, Mill et al. 1997, Mills et al. 1966, Savvaitova et al. 1995, Sindermann 1988).

Recently, Sanders et al. (1999) evaluated the frequency of deformities, erosion, lesions, and tumours (DELTs) on fish captured in seven Ohio streams of varying levels of contamination, as an indicator of environmental quality. The evaluation of DELTs in fish was one of only 10 indicators selected from a list of candidate indicators, for assessments of open and nearshore waters, by participants of the State of the Lakes Ecosystem Conference (SOLEC), 1998 (Bertram and Stadler-Salt 1999). A multi-year assessment of the frequency of DELTs in Great Lakes fishes has been proposed, with an emphasis placed upon evaluating benthic fish species (Bertram and Stadler-Salt 1999). Evaluations of DELTs have also been incorporated into calculations of the index of biotic integrity for surface waters (e.g., Adams et al. 1992, Simon and Emery 1995, Simon and Sanders 1999) and DELT frequencies in fish populations have been directly related to the degree of heavy metal contamination of sediments (OEPA 1997).

The occurrence of DELTs in large fish captured in the Red and Assiniboine rivers was evaluated to assess the health of feral fish in various reaches of the study area. Frequencies of DELTs observed on fish captured in the various study area zones were compared. This report is a synthesis of fish health data obtained during evaluations of fish populations conducted in winter (February and March), July, August, September, and October, 1999. Fish population data are reported in Remnant et al. (2000).

2.0 MATERIALS AND METHODS

2.1 STUDY AREA

The study area for the City of Winnipeg Ammonia Criteria Study consists of seven zones, which are further subdivided into segments (Figure 2). Zones 1A, 3A, 1, 2, and 3 are located on the Red River, extending from Ste. Agathe to north of the City of Selkirk. Zones 4 and 5 are located on the Assiniboine River and extend from Headingley to the confluence of the Red and Assiniboine rivers in the City of Winnipeg. The zones were defined according to the locations of the three WPCCs, the South End WPCC (SEWPCC), the North End WPCC (NEWPCC), and the West End WPCC (WEWPCC), as follows:

- C Zone 1A: extends between Ste. Agathe and St. Adolphe on the Red River. It served as an upstream reference zone in July and September.
- C Zone 1: extends from St. Adolphe to the SEWPCC on the Red River.
- C Zone 2: extends from the SEWPCC to the NEWPCC on the Red River.
- C Zone 3: extends from the NEWPCC to the St. Andrews Locks near the town of Lockport on the Red River.
- C Zone 3A: extends from the St. Andrews Locks at Lockport to downstream of the City of Selkirk on the Red River. Fish were captured in winter, July, and September sampling periods.
- C Zone 4: extends from the WEWPCC on the Assiniboine River to the confluence of the Red and Assiniboine rivers in the City of Winnipeg.
- C Zone 5: extends from Headingley to the WEWPCC on the Assiniboine River. It served as an upstream reference zone, with respect to the WEWPCC.

2.2 SAMPLING METHODS

Fish were captured using standard gang gill nets, hoop nets, and boat electrofishing

techniques (Remnant et al. 2000). Sampling was conducted in winter (February and March 1999), July, August, September, and, at limited sites, in October, 1999. Fish captured by back-pack electrofishing and seining methods were not evaluated for the presence of DELTs as smaller fish are generally shorter-lived and/or not exposed for a sufficient duration to develop DELTs (Simon and Emery 1995).

Fork lengths (± 1 mm) were measured for all fish and round weights (± 25 g) were taken for most individuals. Where possible, sex and state of maturity were determined. Appropriate structures were taken for determining fish age for several species, and results are reported in Remnant et al. (2000).

Every fish was examined externally for the presence of DELTs and parasites. A deformity was defined as a deformed fin or fin ray, head, vertebrae (spinal column), barbel, or other body part. Scale disorientation, such as scale whorling or reversal, was recorded but not included in the deformity category. Erosion included erosion of fins, operculum, tail, or barbel, and fin rot. Lesions were defined as open sores, exposed tissue, ulcerations, cysts, eye anomalies (e.g., cataracts, exophthalmia), or other pathological anomalies not attributable to physical stresses (i.e., gear-related injuries). Tumour-like growths were classified as tumours where the tissue was a solid mass (i.e., not fluid-filled). It is recognized that the tumour category may also include tissue growths that are not true neoplasia (e.g., epidermal hyperplasia, granulomatous growths), as histological confirmations were not performed (Hard 1988). Although not included in the DELT grouping, the presence of external parasites and haemorrhaging was also recorded. Physical injuries, such as injuries from predators or fishing gear, were not considered in the DELT classification.

2.3 DATA ANALYSIS

Mean (\pm S.D.) fork lengths and wet weights were calculated for each species, according to zones, seasons, river, and all data pooled. Wet weights for goldeye under 150 mm were omitted due to the low accuracy of the scale (i.e., precision of the scale). Fork lengths of fish with curved spines were also omitted. Condition factors of all fish were then calculated, where data were sufficient, using the formula: $\text{Wet weight (g)} \times 10^5 / \text{Fork length (mm)}^3$. Mean (\pm S.D.) condition factors were calculated according to the aforementioned

data combinations.

For each fish species, individuals with a minimum of one DELT anomaly were tallied according to zone, season (i.e., month of capture), and river. Individuals with more than one DELT anomaly were also counted as exhibiting multiple DELTs. Total numbers and percentages of fish exhibiting a DELT were also calculated for each DELT category according to zone, season, and river. The total percentage of fish exhibiting a DELT (species pooled) was calculated for each zone and river in order to facilitate spatial comparisons within the study. Data are presented for each month of capture separately as well as in various combinations of pooled data, in order to account for seasonal variability of disease.

3.0

RESULTS AND DISCUSSION

The incidence of DELTs, external parasites, haemorrhaging, and scale disorientation in fish captured in the Red and Assiniboine rivers is presented according to species, zone, and river in Appendices 1 - 21. Summaries of data collected from July through October are presented in Tables 2 and 3 and illustrated in Figures 3 and 4. Fish fork lengths, wet weights, and condition factors are presented in Appendices 22 - 42. The species of fish subject to external examination included: bigmouth buffalo (*Ictiobus cyprinellus*); black bullhead (*Ameiurus melas*); black crappie (*Pomoxis nigromaculatus*); brown bullhead (*Ameiurus nebulosus*); burbot (*Lota lota*); carp (*Cyprinus carpio*); channel catfish (*Ictalurus punctatus*); freshwater drum (*Aplodinotus grunniens*); golden redhorse (*Moxostoma erythrurum*); goldeye (*Hiodon alosoides*); lake cisco (*Coregonus artedii*); mooneye (*Hiodon tergisus*); northern pike (*Esox lucius*); quillback (*Carpiodes cyprinus*); rock bass (*Ambloplites rupestris*); sauger (*Stizostedion canadense*); shorthead redhorse (*Moxostoma macrolepidotum*); silver redhorse (*Moxostoma anisurum*); stonecat (*Noturus flavus*); walleye (*Stizostedion vitreum*); and, white sucker (*Catostomus commersoni*).

3.1 TYPES OF ANOMALIES

A variety of anomalies, examples of which are illustrated in Figures 5 to 14, were observed on fish captured in the Red and Assiniboine rivers. Observed deformities included: wavy fin rays; shortened fins; curved fins; curvature of the spine (lordosis, kyphosis, and scoliosis); and mouth deformities. The most frequent external deformities affected the fins. Observed erosion included fin erosion and rot and missing barbels, with the former occurring much more frequently than the latter. Lesions observed in this study included: cysts; cataracts and haemorrhaging eyes; missing scales associated with inflammation; raised scales; exposed tissue; raised open sores; and ulcers. The tumour category, as previously mentioned, included suspected neoplasms, as no histological confirmation was conducted. Tumours were most commonly observed on or at the base of the pectoral fins, the operculum, and under the mouths of fish. Other types of anomalies that were recorded but not included in the DELT grouping included: white spot on gills; white turbidity on gills; external parasites; scale disorientation; black spot; and haemorrhaging of fins and body surface.

The most predominant types of DELT anomalies observed on fish captured in the Red and Assiniboine rivers were fin erosion (4.7%), followed by lesions (4.3%). Fin erosion and lesions comprised 43.6% and 39.3%, respectively, of all DELTs. Low rates of tumours (0.9%) and deformities (1.0%) were observed on fish in the study area. Tumours and deformities accounted for 7.9% and 8.9%, respectively, of all DELTs.

3.2 DELT FREQUENCIES ACCORDING TO MONTH OF CAPTURE

Because DELT frequencies may vary according to time/season, values were calculated for each sampling month as well as for the months of July through October pooled and are presented in Appendices 1 - 21 and summarized in Tables 2 and 3. However, in the interest of brevity and clarity, the following results and discussion pertain to values derived from pooled data (i.e., July through October; Tables 2 and 3), unless otherwise indicated.

3.3 DELT FREQUENCIES ACCORDING TO ZONE

Due to low catches of fish in zones 1A and 3A, and differences in the relative abundance of fish species captured in each zone (Figure 15), comparisons of DELT frequencies between zones are difficult. Problems associated with differences in relative abundance of fish species between zones are related to the tendency for demersal species to exhibit higher frequencies of DELTs than more pelagic species. Furthermore, as fish are mobile within the study area (Barth and Lawrence 2000), it is difficult to ascertain exposure of individual fish to municipal wastewater discharges or other stressors. Thus, fish captured in zones upstream of WPCCs (i.e., zones 1A, 1 and 5), or far downstream of WPCCs (i.e., zone 3A), may in fact be exposed to effluents (i.e., they may be the same populations). For these reasons, in addition to high river discharges that occurred during the study period, the emphasis of fish health assessment was placed upon determining DELT frequencies within reaches of the study area and comparing these rates to values reported for other systems in the literature.

Frequencies of DELTs were generated for each fish species as well as for all species combined (i.e., the percentage of all fish captured with a DELT) for each month of capture (Appendices 1 - 21) and for all data combined (i.e., July through October), according to zone (Table 2), and for the Assiniboine and Red rivers (Table 3). For all data combined,

low incidences of DELTs (2.0% and 0.6%), were observed on fish captured in the reference zones 1A and 3A, respectively, in the Red River (Table 2). Higher frequencies were observed in zones 1 (13.8%), 2 (7.2%), 3 (9.3%), 4 (14.7%), and 5 (24.3%).

Multiple DELTs (i.e., individuals exhibiting more than one DELT) were observed on fish captured in zones 1 (3.1%), 2 (0.6%), 3 (1.0%), and 4 (1.6%), but not in zones 1A, 3A, or 5 (Table 2). With the exception of sauger, the species afflicted with multiple DELTs were demersal: white sucker, carp, quillback, channel catfish, freshwater drum, golden redhorse, and shorthead redhorse. High rates of multiple DELTs (10.9%) were observed on carp captured in zone 4.

The frequencies of DELTs varied between species within and between zones (Figure 3; Table 2). In zones 1A and 3A, goldeye (2.3%) and sauger (0.8%), respectively, were the only species observed with a DELT. Conversely, in zone 1, the frequency of DELTs observed on white sucker was high (60%), and substantive on shorthead redhorse (33.3%), sauger (18.8%), and channel catfish (14.3%). Excluding rock bass, as only one fish was captured, the highest frequencies of DELTs occurred on quillback (27.7%), silver redhorse (20.0%), white sucker (16.1%), shorthead redhorse (12.2%), and freshwater drum (11.1%) in zone 2. In zone 3, high frequencies were observed on quillback (25.8%), golden (25.0%) and silver redhorse (25.0%), white sucker (19.5%), freshwater drum (13.3%), walleye (12.5%), and carp (11.3%). In zone 4, high rates of DELTs were observed on carp (43.8%), quillback (33.3%), bigmouth buffalo (33.3%), silver redhorse (30.0%), golden redhorse (17.4%), goldeye (14.3%), channel catfish (13.0%), white sucker (12.2%), and shorthead redhorse (11.7%). The species exhibiting high frequencies of DELTs in zone 5, excluding silver redhorse for which only one individual was captured, were freshwater drum (80.0%), walleye (50.0%), white sucker (33.3%), and shorthead redhorse (23.8%). It is noted that because fewer fish were captured in zone 5 relative to zones 1 through 4, the calculated frequency of DELTs for some species captured in zone 5 may not be accurate.

Because catches of fish varied between zones (Figure 15), and were often low for some species, it is also of interest to examine the species afflicted with the majority of DELT anomalies (i.e., number of individuals of each species with a DELT / the total number of fish of all species with a DELT). In zone 1, 33.3% of all DELTs were observed on both

sauger and white sucker and 22.2% on channel catfish. In zone 2, the species that comprised the greatest fraction of observed DELTs were channel catfish (22.4%), quillback (22.4%), white sucker (17.2%), and sauger (15.5%). In zone 3, 32.3% of DELTs were observed on quillback, 27.1% on white sucker, and 11.5% on channel catfish and freshwater drum. In the Assiniboine River, shorthead redhorse comprised the largest fraction of DELTs in zone 4 (31.2%), followed by carp (30.1%) and channel catfish (10.8%). While shorthead redhorse also comprised a significant fraction of the observed DELTs (29.4%) in zone 5, the greatest fraction of DELTs occurred on freshwater drum (47.1%).

The number of species where at least one individual exhibited a DELT anomaly also varied between zones. In zones 1A and 3A, as only one DELT was observed in each case, only one species (goldeye in zone 1A and sauger in zone 3A) exhibited a DELT. In zone 1, four species were found to have a DELT. In zones 2 and 3, downstream of the SEWPCC and the NEWPCC, respectively, 11 species exhibited a DELT. In the Assiniboine River, 11 species exhibited a DELT in zone 4, whereas only 6 exhibited a DELT in zone 5.

3.4 DELT FREQUENCIES IN THE RED AND ASSINIBOINE RIVERS

The frequency of DELT anomalies was approximately twice as high in the Assiniboine River (zones 4 and 5; 15.6%), relative to the Red River (zones 1, 2, 3, and 3A; 7.9%) (Table 3; Figure 4). The overall frequency of DELTs in zones 1 through 5 and 3A combined was 9.8%. Twelve and thirteen species exhibited DELTs in the Assiniboine and Red rivers, respectively.

The most frequent DELTs observed on fish captured in the Assiniboine River (zones 4 and 5) were lesions (7.3%) and erosion (6.5%). Erosion and lesions occurred in 4.1% and 3.3%, respectively, of fish captured in the Red River (zones 1 - 3 and 3A). Deformities occurred at a rate approximately five times higher in fish captured in the Assiniboine River (2.4%) than the Red River (0.5%). The occurrence of tumours on fish was similar for the Red (0.8%) and Assiniboine (1.0%) rivers. Multiple DELTs were more frequently observed on fish captured in the Assiniboine River (1.4%) than the Red River (0.8%). However, more species of fish exhibited multiple DELTs in the Red River than the Assiniboine River. The incidence of external parasitism was approximately twice as high in the Red River (19.3%) than in the Assiniboine River (7.1%).

3.5 SPECIES DIFFERENCES

The highest frequencies of DELTs were observed in demersal fish species, such as quillback, channel catfish, white sucker, shorthead redhorse, golden redhorse, silver redhorse, carp, and freshwater drum in the Red and Assiniboine rivers. Tumours occurred exclusively on benthic fish species, with the exception of one sauger. Catches of other demersal fish species (i.e., brown bullhead, black bullhead, and stonecat) that typically exhibit high frequencies of anomalies were inadequate to generate reliable estimates of DELT frequencies (Sanders et al. 1999 advocate a minimum sample size of 15 fish).

Benthic feeding fish species, and those with a high degree of association with the sediments, typically exhibit high frequencies of anomalies, relative to pelagic or piscivorous species (e.g., Barker et al. 1994, Emery et al. 1999, Fournie et al. 1996, Leadley et al. 1998, Malins et al. 1984, Skinner and Kandrashoff 1988). Because sediments accumulate the highest concentrations and greatest burdens of contaminants in freshwater and marine environments, demersal fish species typically experience greater exposures to contaminants in the aquatic environment (Vethaak and ap Rheinallt 1992). A strong correlation between the prevalence of gross pathological abnormalities and sediment contaminants was reported in an extensive survey of estuarine and coastal sites in Virginia and Louisiana (Fournie et al. 1996).

With respect to specific types of anomalies, some species-specific trends are recognizable. Interspecific variation in the resistance of fish to fin erosion has been reported for marine species (Wellings et al. 1976). Black bullhead developed neoplasms following exposure to chlorinated municipal wastewaters, whereas channel catfish did not (Grizzle et al. 1988). The benthic fourhorn sculpin exhibited unusually high frequencies of skeletal anomalies at contaminated and uncontaminated sites in the Gulf of Bothnia, the reason(s) for which are unclear (Bengtsson et al. 1985). This species=association with sediments, and thus high exposure to metals in sediments, is one possible explanation.

Emery et al. (1999) reported that the presence and abundance of suckers will affect the the frequency of DELTs calculated for any given site, as catostomids frequently exhibit DELTs due to their benthic habit. For example, in the Ohio River, catostomids accounted for 27%

of the observed DELTs, whereas the remaining 73% of DELTs was comprised of 15 other families (Emery et al. 1999). In large river systems in Alberta, sucker species were also found to exhibit very high frequencies of anomalies in some sampling areas (Mill et al. 1997). Similarly, Sanders et al. (1999) reported that the highest percentages of DELTs were observed on medium- to large-size bottom-feeding taxa (carp, suckers, and catfish) in seven Ohio streams. Due to variations in the susceptibility of fish species (or families) to DELTs, differences in the relative abundance of fish species between sites will affect calculations of DELT frequencies for all species pooled. This »species bias« renders comparisons of DELT frequencies between systems, or even different areas of the same system, difficult.

4.0

LITERATURE CITED

- ADAMS, S.M., W.D. CRUMBY, M.S. GREELEY, JR., L.R. SHUGART, and C.F. SAYLOR. 1992. Responses of fish populations and communities to pulp mill effluents: A holistic assessment. *Ecotoxicol. Environ. Safety* 24: 347-360.
- BARKER, D.E., R.A. KHAN, and R. HOOPER. 1994. Bioindicators of stress in winter flounder, *Pleuronectes americanus*, captured adjacent to a pulp and paper mill in St. George's Bay, Newfoundland. *Can. J. Fish. Aquat. Sci.* 51: 2203-2209.
- BARTH, C.C., and M. LAWRENCE. 2000. Movements of fish tagged with acoustic transmitters in the vicinity of the City of Winnipeg's Water Pollution Control Centres, 1999-2000. Phase 2 Technical Memorandum for Red and Assiniboine Ammonia Criteria Study. Fish Behaviour Technical Memorandum #FB-03.
- BENGTSSON, B.E., Å. BENGTSSON, and M. HIMBERG. 1985. Fish deformities and pollution in some Swedish waters. *Ambio* 14: 32-35.
- BERTRAM, P., and N. STADLER-SALT. 1999. State of the Lakes Ecosystem Conference 1998. Selection of indicators for Great Lakes Basin ecosystem health. Version 3. Draft for Review. Prepared by USEPA and Environment Canada, May 1999. Available at: <http://www.cciw.ca/solec/> or <http://www.epa.gov/glnpo/solec/>.
- COUCH, J.A. 1985. Prospective study of infectious and non-infectious disease in oysters and fishes in three Gulf of Mexico Estuaries. *Dis. Aquat. Org.* 1: 59-82.
- EMERY, E.B., T.P. SIMON, and R. OVIES. 1999. Influence of the family Catostomidae on the metrics developed for a great river index of biotic integrity. In: T.P. Simon (Ed.), *Assessing the sustainability and biological integrity of water resources using fish communities*. CRC Press, Boca Raton, FL. Pp. 203-224.
- FOURNIE, J.W., J.K. SUMMERS, and S.B. WEISBERG. 1996. Prevalence of gross pathological abnormalities in estuarine fishes. *Trans. Am. Fish. Soc.* 125: 581-590.

- GRIZZLE, J.M., S.A. HOROWITZ, and D.R. STRENGTH. 1988. Caged fish as monitors of pollution: Effects of chlorinated effluent from a wastewater treatment plant. *Wat. Res. Bull.* 24: 951-959.
- HARD, G.C. 1988. Fish tumors and ecological surveillance: A cautionary example from Port Phillip Bay. *Wat. Res. Bull.* 24: 975-980.
- KARR, J.R., K.D. FAUSCH, P.L. ANGERMIER, P.R. YANT, and I.J. SCHLOSSER. 1986. Assessing biological integrity in running waters: A method and its rationale. Illinois Natural History Survey Special Publication 5.
- LAWLER, G.H. 1961. Abnormalities in Lake Erie whitefish. *J. Fish. Res. Bd. Can.* 18: 283-285.
- LEADLEY, T.A., G. BALCH, C.D. METCALFE, R. LAZAR, E. MAZAK, J. HABOWSKY, and G.D. HAFFNER. 1998. Chemical accumulation and toxicological stress in three brown bullhead (*Ameiurus nebulosus*) populations of the Detroit River, Michigan, USA. *Environ. Toxicol. Chem.* 17: 1756-1766.
- MALINS, D.C., B.B. MCCAIN, D.W. BROWN, S.-L. CHAN, M.S. MYERS, J.T. LANDAHL, P.G. PROHASKA, A.J. FRIEDMAN, L.D. RHODES, D.G. BURROWS, W.D. GRONLUND, and H.O. HODGINS. 1984. Chemical pollutants in sediments and diseases of bottom-dwelling fish in Puget Sound, Washington. *Environ. Sci. Technol.* 18: 705-713.
- MCCAIN, B.B., S.-L. CHAN, M.M. KRAHN, D.W. BROWN, M.S. MYERS, J.T. LANDAHL, S. PIERCE, R.C. CLARK, JR., and U. VARANASI. 1992. Chemical contamination and associated fish diseases in San Diego Bay. *Environ. Sci. Technol.* 26: 725-733.
- MILL, T.A., P. SPARROW-CLARK, and R.S. BROWN. 1997. Fish distribution, movement and gross external pathology information for the Peace, Athabasca, and Slave River Basins. Northern River Basins Study Project Report No. 147. Northern River Basins Study, Edmonton, Alberta. 59 pp.

- MILLS, H.B., W.C. STARRETT, and F.C. BELLROSE. 1966. Man's effect on the fish and wildlife of the Illinois River. Ill. Nat. Hist. Surv. Biol. Notes No. 57. 24 pp.
- MOORE, C.J., and J.H. HIXSON. 1977. Incidence of crooked vertebral columns in adult Potomac River white perch, *Morone americana*. *Copeia* 1977: 384-387.
- OHIO ENVIRONMENTAL PROTECTION AGENCY (OEPA). 1997. Using biological criteria to validate applications of water quality criteria: Dissolved and total recoverable metals. OEPA Technical Bulletin 1997-12-4. Prepared by State of OEPA, Division of Surface Water, Monitoring and Assessment Section, Columbus, Ohio.
- OHIO ENVIRONMENTAL PROTECTION AGENCY (OEPA). 1999. Association between nutrients, habitat, and the aquatic biota in Ohio rivers and streams. Ohio EPA Technical Bulletin MAS/1999-1-1, January, 1999. Ohio EPA, Columbus, Ohio.
- PIPPY, J.H.C., and G.M. HARE. 1969. Relationship of river pollution to bacterial infection in salmon (*Salmo salar*) and suckers (*Catostomus commersoni*). *Trans. Am. Fish. Soc.* 4: 685-690.
- REMNANT, R.A., S.L. DAVIES, and R.L. BRETECHER. 2000. Species composition, abundance, and distribution of fish in the Red and Assiniboine rivers within the City of Winnipeg, 1999. Phase 2 Technical Memorandum for Red and Assiniboine Ammonia Criteria Study. In preparation.
- SANDERS, R.E., R.J. MILTNER, C.O. YODER, and E.T. RANKIN. 1999. The use of external deformities, erosion, lesions, and tumors (DELT anomalies) in fish assemblages for characterizing aquatic resources: A case study of seven Ohio streams. In: T.P. Simon (Ed.), *Assessing the sustainability and biological integrity of water resources using fish communities*. CRC Press, Boca Raton, FL. Pp: 225-246.
- SAVVAITOVA, K.A., Y.V. CHEBOTAREVA, M.Y. PICHUGIN, and S.V. MAKSIMOV. 1995. Anomalies of fishes as environmental indicators. *J. Ichthyol.* 35: 147-158. Translated from: *Voprosy ikhtiologii*, 1995, 35: 182-188.

- SIMON, T.P., and E.B. EMERY. 1995. Modification and assessment of an index of biotic integrity to quantify water resource quality in great rivers. *Reg. Riv.: Res. Manage.* 11: 283-298.
- SIMON, T.P., and R.E. SANDERS. 1999. Applying an index of biotic integrity based on Great-River fish communities: Considerations in sampling and interpretation. In: T.P. Simon (Ed.), *Assessing the sustainability and biological integrity of water resources using fish communities*. CRC Press, Boca Raton, FL. Pp: 475-505.
- SINDERMANN, C.J. 1979. Pollution-associated diseases and abnormalities of fish and shellfish: A review. *Fish. Bull.* 76: 717-749.
- SINDERMANN, C.J. 1988. Biological indicators and biological effects of estuarine/coastal pollution. *Wat. Res. Bull.* 24: 931-939.
- SKINNER, R.H., and W. KANDRASHOFF. 1988. Abnormalities and diseases observed in commercial fish catches from Biscayne Bay, Florida. *Wat. Res. Bull.* 24: 961-966.
- SLOOFF, W. 1982. Skeletal anomalies in fish from polluted surface waters. *Aquat. Toxicol.* 2: 157-173.
- SNIESZKO, S.F. 1974. The effects of environmental stress on outbreaks of infectious diseases of fishes. *J. Fish Biol.* 6: 197-208.
- VAN BANNING, P. 1987. Long-term recording of some fish diseases using general fishery research surveys in the south-east part of the North Sea. *Dis. Aquat. Org.* 3: 1-11.
- VAN DEN AVYLE, M.J. S.J. GARVICK, V.S. BLAZER, S.J. HAMILTON, and W.G. BRUMBAUGH. 1989. Skeletal deformities in smallmouth bass, *Micropterus dolomieu*, from southern Appalachian reservoirs. *Arch. Environ. Contam. Toxicol.* 18: 688-696.
- VETHAAK, A.D., and T. ap RHEINALLT. 1992. Fish disease as a monitor for marine pollution: the case of the North Sea. *Rev. Fish Biol. Fish.* 2: 1-32.

- WEIS, P., and J.S. WEIS. 1976. Abnormal locomotion associated with skeletal malformations in the sheepshead minnow, *Cyprinodon variegatus*, exposed to malathion. Environ. Res. 12: 196-200.
- WELLINGS, S.R., C.E. ALPERS, B.B. MCCAIN, and B.S. MILER. 1976. Fin erosion disease of starry flounder (*Platichthys stellatus*) and English sole (*Parophrys vetulus*) in the estuary of the Duwamish River, Seattle, Washington. J. Fish. Res. Bd. Can. 33: 2577-2586.
- WILLFORD, W.A. 1988. Persistent toxic substances and the health of fish communities in the Great Lakes. In: M.S. Evans (Ed.), Toxic contaminants and ecosystem health: A great lakes focus. Volume 21 Wiley Series, J.O. Nriagu (Ed.), Advances in environmental science and technology. John Wiley & Sons, New York. Pp. 549-555.

TABLES AND FIGURES

Table 1. Factors that may influence the occurrence and severity of disease in fish (Vethaak and ap Rheinallt 1992).

External environment

Physicochemical and biological factors

- Chemical contaminants
- Sediment composition; currents
- Temperature, salinity, pH
- Oxygen deficiency
- Eutrophication
- Bacteria, viruses, other microbes and parasites
- Algal toxins (blue-green algae)

Geographic location

- Food supply
- Fisheries (habitat destruction, net injuries)
- Population density
- Selection pressure
- Competition

Host factors and internal environment

Length/age

- Sex
- Genetic factors
- Physiological factors (osmotic regulation, growth)
- Nutritional condition
- Movements (spawning or other migrations)
- Endocrine factors
- Immunological factors
- Behavioural stress (spawning, feeding, social)
- Bioaccumulative capacity
- Processes of detoxification and activation
- Processes of pathogenesis/carcinogenesis
- Association with sediments

Temporal factors

- Duration and intensity of exposure to disease risks
 - Latent period of disease
 - Cohort history
-

Table 2. Numbers and frequencies of DELTs and other anomalies observed on fish captured in the Red and Assiniboine rivers, according to zone, July through October 1999. ¹ Species codes are presented in Appendix 3.

Zone	Species ¹	Total Number of Fish Captured (n)	One DELT		Number of fish with DELT or other anomaly								
			Number of fish	Frequency (%)	Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	
1A	BGBF	1	0	0.0	0	0	0	0	0	0	0	0	0
1A	BLBL	0	-	-	-	-	-	-	-	-	-	-	-
1A	BLCR	0	-	-	-	-	-	-	-	-	-	-	-
1A	BRBL	0	-	-	-	-	-	-	-	-	-	-	-
1A	BURB	0	-	-	-	-	-	-	-	-	-	-	-
1A	CARP	1	0	0.0	0	0	0	0	0	0	0	0	1
1A	CHCT	0	-	-	-	-	-	-	-	-	-	-	-
1A	FRDR	0	-	-	-	-	-	-	-	-	-	-	-
1A	GLRD	0	-	-	-	-	-	-	-	-	-	-	-
1A	GOLD	43	1	2.3	0	1	0	0	0	1	1	0	0
1A	MOON	0	-	-	-	-	-	-	-	-	-	-	-
1A	NRPK	0	-	-	-	-	-	-	-	-	-	-	-
1A	QUIL	0	-	-	-	-	-	-	-	-	-	-	-
1A	RCBS	0	-	-	-	-	-	-	-	-	-	-	-
1A	SAUG	2	0	0.0	0	0	0	0	0	0	0	0	0
1A	SHRD	2	0	0.0	0	0	0	0	0	0	0	0	0
1A	SLRD	1	0	0.0	0	0	0	0	0	1	0	0	0
1A	STCT	0	-	-	-	-	-	-	-	-	-	-	-
1A	WALL	1	0	0.0	0	0	0	0	0	0	0	0	0
1A	WHSC	0	-	-	-	-	-	-	-	-	-	-	-
1A	Total % of DELTs	51	1	2.0	0	1	0	0	0	2	1	1	1
					0.0	100.0	0.0	0.0	0.0				

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	One DELT		Number of fish with DELT or other anomaly								
			Number of fish	Frequency (%)	Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	
1	BGBF	2	0	0.0	0	0	0	0	0	0	0	0	0
1	BLBL	0	-	-	-	-	-	-	-	-	-	-	-
1	BLCR	1	0	0.0	0	0	0	0	0	0	0	0	0
1	BRBL	1	0	0.0	0	0	0	0	0	0	0	0	0
1	BURB	0	-	-	-	-	-	-	-	-	-	-	-
1	CARP	0	-	-	-	-	-	-	-	-	-	-	-
1	CHCT	14	2	14.3	0	0	0	2	0	11	0	-	-
1	FRDR	0	-	-	-	-	-	-	-	-	-	-	-
1	GLRD	0	-	-	-	-	-	-	-	-	-	-	-
1	GOLD	18	0	0.0	0	0	0	0	0	0	0	0	1
1	MOON	0	-	-	-	-	-	-	-	-	-	-	-
1	NRPK	0	-	-	-	-	-	-	-	-	-	-	-
1	QUIL	1	0	0.0	0	0	0	0	0	0	0	0	0
1	RCBS	0	-	-	-	-	-	-	-	-	-	-	-
1	SAUG	16	3	18.8	0	0	3	0	0	2	0	0	0
1	SHRD	3	1	33.3	0	0	1	0	0	0	0	0	1
1	SLRD	1	0	0.0	0	0	0	0	0	0	0	0	0
1	STCT	0	-	-	-	-	-	-	-	-	-	-	-
1	WALL	3	0	0.0	0	0	0	0	0	0	0	1	0
1	WHSC	5	3	60.0	2	0	3	2	0	0	0	0	0
1	Total	65	9	13.8	2	0	7	4	0	13	1	2	
	% of DELTs				18.2	0.0	63.6	36.4	0.0				

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	One DELT		Number of fish with DELT or other anomaly								
			Number of fish	Frequency (%)	Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	
2	BGBF	0	-	-	-	-	-	-	-	-	-	-	-
2	BLBL	3	0	0	0	0	0	0	0	0	0	0	0
2	BLCR	1	0	0	0	0	0	0	0	0	0	0	0
2	BRBL	1	0	0.0	0	0	0	0	0	0	0	0	0
2	BURB	11	0	0.0	0	0	0	0	0	0	0	0	-
2	CARP	14	1	7.1	0	0	0	1	0	1	0	1	1
2	CHCT	358	13	3.6	1	0	4	5	5	239	3	-	-
2	FRDR	27	3	11.1	1	0	3	1	0	3	0	1	1
2	GLRD	5	0	0.0	0	0	0	0	0	0	0	0	0
2	GOLD	39	1	2.6	0	0	0	1	0	0	3	0	0
2	MOON	0	-	-	-	-	-	-	-	-	-	-	-
2	NRPK	5	0	0.0	0	0	0	0	0	0	0	0	0
2	QUIL	47	13	27.7	0	0	9	4	0	1	2	6	6
2	RCBS	1	1	100.0	0	0	0	1	0	0	0	0	0
2	SAUG	169	9	5.3	1	0	8	2	0	6	0	0	0
2	SHRD	41	5	12.2	0	0	1	3	1	2	0	6	6
2	SLRD	5	1	20.0	0	0	0	1	0	0	0	0	0
2	STCT	2	0	0.0	0	0	0	0	0	0	0	0	0
2	WALL	20	1	5.0	0	0	1	0	0	0	0	0	0
2	WHSC	62	10	16.1	2	0	4	6	2	4	1	6	6
2	Total	811	58	7.2	5	0	30	25	8	256	9	20	20
	% of DELTs				7.9	0.0	47.6	39.7	12.7				

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	One DELT		Number of fish with DELT or other anomaly								
			Number of fish	Frequency (%)	Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	
3	BGBF	0	-	-	-	-	-	-	-	-	-	-	-
3	BLBL	0	-	-	-	-	-	-	-	-	-	-	-
3	BLCR	1	0	0	0	0	0	0	0	0	0	0	0
3	BRBL	2	0	0.0	0	0	0	0	0	0	0	0	0
3	BURB	11	1	9.1	0	0	1	0	0	0	0	0	-
3	CARP	53	6	11.3	1	2	0	5	0	3	2	1	1
3	CHCT	338	11	3.3	1	2	3	5	2	88	1	-	-
3	FRDR	83	11	13.3	0	0	8	3	0	6	0	2	2
3	GLRD	4	1	25.0	1	0	1	1	0	0	1	2	2
3	GOLD	47	0	0.0	0	0	0	0	0	0	0	0	0
3	MOON	2	0	0.0	0	0	0	0	0	0	0	0	0
3	NRPK	13	0	0.0	0	0	0	0	0	1	0	0	0
3	QUIL	120	31	25.8	3	2	25	5	2	0	11	37	37
3	RCBS	2	0	0.0	0	0	0	0	0	0	0	0	0
3	SAUG	170	3	1.8	1	2	0	1	1	7	0	0	0
3	SHRD	44	4	9.1	0	0	1	3	0	2	0	10	10
3	SLRD	4	1	25.0	0	0	1	0	0	0	0	1	1
3	STCT	2	0	0.0	0	0	0	0	0	0	0	0	0
3	WALL	8	1	12.5	0	0	0	1	0	1	0	0	0
3	WHSC	133	26	19.5	3	2	9	14	4	18	18	6	6
3	Total	1037	96	9.3	10	10	49	38	9	126	33	59	59
	% of DELTs				9.4	9.4	46.2	35.8	8.5				

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	One DELT		Number of fish with DELT or other anomaly								
			Number of fish	Frequency (%)	Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	
3A	BGBF	0	-	-	-	-	-	-	-	-	-	-	-
3A	BLBL	0	-	-	-	-	-	-	-	-	-	-	-
3A	BLCR	0	-	-	-	-	-	-	-	-	-	-	-
3A	BRBL	1	0	0.0	0	0	0	0	0	0	0	0	0
3A	BURB	2	0	0.0	0	0	0	0	0	0	0	0	-
3A	CARP	3	0	0.0	0	0	0	0	0	0	0	0	0
3A	CHCT	0	-	-	-	-	-	-	-	-	-	-	-
3A	FRDR	1	0	0.0	0	0	0	0	0	0	0	0	0
3A	GLRD	1	0	0.0	0	0	0	0	0	0	0	1	0
3A	GOLD	26	0	0.0	0	0	0	0	0	0	0	0	0
3A	MOON	0	-	-	-	-	-	-	-	-	-	-	-
3A	NRPK	0	-	-	-	-	-	-	-	-	-	-	-
3A	QUIL	0	-	-	-	-	-	-	-	-	-	-	-
3A	RCBS	0	-	-	-	-	-	-	-	-	-	-	-
3A	SAUG	122	1	0.8	0	0	0	1	0	5	0	0	0
3A	SHRD	3	0	0.0	0	0	0	0	0	0	0	0	0
3A	SLRD	2	0	0.0	0	0	0	0	0	0	0	0	0
3A	STCT	0	-	-	-	-	-	-	-	-	-	-	-
3A	WALL	3	0	0.0	0	0	0	0	0	0	0	0	0
3A	WHSC	3	0	0.0	0	0	0	0	0	1	0	0	0
3A	Total	167	1	0.6	0	0	0	1	0	6	1	0	0
	% of DELTs				0.0	0.0	0.0	100.0	0.0				

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	One DELT		Number of fish with DELT or other anomaly							
			Number of fish	Frequency (%)	Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
4	BGBF	3	1	33.3	0	0	1	0	0	0	1	0
4	BLBL	0	-	-	-	-	-	-	-	-	-	-
4	BLCR	1	0	0	0	0	0	0	0	0	0	0
4	BRBL	0	-	-	-	-	-	-	-	-	-	-
4	BURB	0	-	-	-	-	-	-	-	-	-	-
4	CARP	64	28	43.8	7	3	11	21	1	1	2	0
4	CHCT	77	10	13	0	3	4	2	1	20	5	-
4	FRDR	47	3	6.4	0	0	2	1	0	3	0	0
4	GLRD	23	4	17.4	0	0	3	1	0	0	0	6
4	GOLD	14	2	14.3	0	1	0	1	0	0	1	0
4	MOON	2	0	0.0	0	0	0	0	0	0	0	0
4	NRPK	0	-	-	-	-	-	-	-	-	-	-
4	QUIL	18	6	33.3	1	1	5	0	1	0	1	3
4	RCBS	0	-	-	-	-	-	-	-	-	-	-
4	SAUG	76	2	2.6	0	0	2	0	0	1	0	0
4	SHRD	248	29	11.7	1	4	3	20	3	10	1	90
4	SLRD	10	3	30.0	0	1	1	0	1	1	0	4
4	STCT	1	0	0.0	0	0	0	0	0	0	0	0
4	WALL	8	0	0.0	0	0	0	0	0	0	0	1
4	WHSC	41	5	12.2	1	3	1	2	0	10	6	5
4	Total % of DELTs	633	93	14.7	10	16	33	48	7	46	17	109
					9.6	15.4	31.7	46.2	6.7			

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	One DELT		Number of fish with DELT or other anomaly								
			Number of fish	Frequency (%)	Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	
5	BGBF	0	-	-	-	-	-	-	-	-	-	-	-
5	BLBL	0	-	-	-	-	-	-	-	-	-	-	-
5	BLCR	0	-	-	-	-	-	-	-	-	-	-	-
5	BRBL	1	0	0.0	0	0	0	0	0	0	0	0	0
5	BURB	0	-	-	-	-	-	-	-	-	-	-	-
5	CARP	2	0	0.0	0	0	0	0	0	0	0	0	0
5	CHCT	17	1	5.9	0	0	0	1	0	1	0	0	-
5	FRDR	10	8	80.0	0	0	8	0	0	0	0	0	0
5	GLRD	2	0	0.0	0	0	0	0	0	0	0	0	0
5	GOLD	3	0	0.0	0	0	0	0	0	0	0	0	0
5	MOON	0	-	-	-	-	-	-	-	-	-	-	-
5	NRPK	3	0	0.0	0	0	0	0	0	0	0	0	0
5	QUIL	0	-	-	-	-	-	-	-	-	-	-	-
5	RCBS	0	-	-	-	-	-	-	-	-	-	-	-
5	SAUG	5	0	0.0	0	0	0	0	0	0	0	0	0
5	SHRD	21	5	23.8	0	1	2	2	0	3	0	0	5
5	SLRD	1	1	100.0	0	0	1	0	0	0	0	0	0
5	STCT	0	-	-	-	-	-	-	-	-	-	-	-
5	WALL	2	1	50.0	0	0	1	0	0	0	0	0	0
5	WHSC	3	1	33.3	0	0	1	0	0	0	0	1	0
5	Total	70	17	24.3	0	1	13	3	0	4	1	5	
	% of DELTs				0.0	5.9	76.5	17.6	0.0				

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	One DELT		Number of fish with DELT or other anomaly								
			Number of fish	Frequency (%)	Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	
ALL	BGBF	6	1	16.7	0	0	1	0	0	0	0	1	0
ALL	BLBL	3	0	0.0	0	0	0	0	0	0	0	0	0
ALL	BLCR	4	0	0.0	0	0	0	0	0	0	0	0	0
ALL	BRBL	6	0	0.0	0	0	0	0	0	0	0	0	0
ALL	BURB	24	1	4.2	0	0	1	0	0	0	0	0	0
ALL	CARP	137	35	25.5	8	5	11	27	1	5	4	3	3
ALL	CHCT	804	37	4.6	2	5	11	15	8	359	9	0	0
ALL	FRDR	168	25	14.9	1	0	21	5	0	12	0	3	3
ALL	GLRD	35	5	14.3	1	0	4	2	0	0	2	8	8
ALL	GOLD	190	4	2.1	0	2	0	2	0	1	5	1	1
ALL	MOON	4	0	0.0	0	0	0	0	0	0	0	0	0
ALL	NRPK	21	0	0.0	0	0	0	0	0	1	0	0	0
ALL	QUIL	186	50	26.9	4	3	39	9	3	1	14	46	46
ALL	RCBS	3	1	33.3	0	0	0	1	0	0	0	0	0
ALL	SAUG	560	18	3.2	2	2	13	4	1	21	0	0	0
ALL	SHRD	362	44	12.2	1	5	8	28	4	17	1	112	112
ALL	SLRD	24	6	25.0	0	1	3	1	1	2	0	5	5
ALL	STCT	5	0	0.0	0	0	0	0	0	0	0	0	0
ALL	WALL	45	3	6.7	0	0	2	1	0	1	1	1	1
ALL	WHSC	247	45	18.2	8	5	18	24	6	33	26	17	17
ALL	Total	2834	275	9.7	27	28	132	119	24	453	63	196	196
	% of DELTs				8.9	9.2	43.6	39.3	7.9				

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly (%)								% of DELTs
			Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	
1A	BGBF	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1A	BLBL	0	-	-	-	-	-	-	-	-	-
1A	BLCR	0	-	-	-	-	-	-	-	-	-
1A	BRBL	0	-	-	-	-	-	-	-	-	-
1A	BURB	0	-	-	-	-	-	-	-	-	-
1A	CARP	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
1A	CHCT	0	-	-	-	-	-	-	-	-	-
1A	FRDR	0	-	-	-	-	-	-	-	-	-
1A	GLRD	0	-	-	-	-	-	-	-	-	-
1A	GOLD	43	0.0	2.3	0.0	0.0	0.0	2.3	2.3	0.0	100.0
1A	MOON	0	-	-	-	-	-	-	-	-	-
1A	NRPK	0	-	-	-	-	-	-	-	-	-
1A	QUIL	0	-	-	-	-	-	-	-	-	-
1A	RCBS	0	-	-	-	-	-	-	-	-	-
1A	SAUG	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1A	SHRD	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1A	SLRD	1	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
1A	STCT	0	-	-	-	-	-	-	-	-	-
1A	WALL	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1A	WHSC	0	-	-	-	-	-	-	-	-	-
1A	Total	51	0.0	2.0	0.0	0.0	0.0	3.9	2.0	2.0	100.0

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly (%)								% of DELTs
			Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	
1	BGBF	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	BLBL	0	-	-	-	-	-	-	-	-	-
1	BLCR	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	BRBL	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	BURB	0	-	-	-	-	-	-	-	-	-
1	CARP	0	-	-	-	-	-	-	-	-	-
1	CHCT	14	0.0	0.0	0.0	14.3	0.0	78.6	0.0	-	22.2
1	FRDR	0	-	-	-	-	-	-	-	-	-
1	GLRD	0	-	-	-	-	-	-	-	-	-
1	GOLD	18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	0.0
1	MOON	0	-	-	-	-	-	-	-	-	-
1	NRPK	0	-	-	-	-	-	-	-	-	-
1	QUIL	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	RCBS	0	-	-	-	-	-	-	-	-	-
1	SAUG	16	0.0	0.0	18.8	0.0	0.0	12.5	0.0	0.0	33.3
1	SHRD	3	0.0	0.0	33.3	0.0	0.0	0.0	0.0	33.3	11.1
1	SLRD	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	STCT	0	-	-	-	-	-	-	-	-	-
1	WALL	3	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0
1	WHSC	5	40.0	0.0	60.0	40.0	0.0	0.0	0.0	0.0	33.3
1	Total	65	3.1	0.0	10.8	6.2	0.0	20.0	1.5	3.1	100.0

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly (%)								% of DELTs	
			Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation		
2	BGBF	0	-	-	-	-	-	-	-	-	-	
2	BLBL	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	BLCR	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	BRBL	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	BURB	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0
2	CARP	14	0.0	0.0	0.0	7.1	0.0	7.1	0.0	7.1	7.1	1.7
2	CHCT	358	0.3	0.0	1.1	1.4	1.4	66.8	0.8	-	-	22.4
2	FRDR	27	3.7	0.0	11.1	3.7	0.0	11.1	0.0	0.0	3.7	5.2
2	GLRD	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	GOLD	39	0.0	0.0	0.0	2.6	0.0	0.0	0.0	7.7	0.0	1.7
2	MOON	0	-	-	-	-	-	-	-	-	-	-
2	NRPK	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	QUIL	47	0.0	0.0	19.1	8.5	0.0	2.1	4.3	12.8	12.8	22.4
2	RCBS	1	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	1.7
2	SAUG	169	0.6	0.0	4.7	1.2	0.0	3.6	0.0	0.0	0.0	15.5
2	SHRD	41	0.0	0.0	2.4	7.3	2.4	4.9	0.0	0.0	14.6	8.6
2	SLRD	5	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	1.7
2	STCT	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	WALL	20	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7
2	WHSC	62	3.2	0.0	6.5	9.7	3.2	6.5	1.6	0.0	9.7	17.2
2	Total	811	0.6	0.0	3.7	3.1	1.0	31.6	1.1	2.5	2.5	100.0

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly (%)							% of DELTs	
			Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Scale Hemmorhaging Disorientation		
3	BGBF	0	-	-	-	-	-	-	-	-	-
3	BLBL	0	-	-	-	-	-	-	-	-	-
3	BLCR	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	BRBL	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	BURB	11	0.0	0.0	9.1	0.0	0.0	0.0	0.0	-	1.0
3	CARP	53	1.9	3.8	0.0	9.4	0.0	5.7	3.8	1.9	6.3
3	CHCT	338	0.3	0.6	0.9	1.5	0.6	26.0	0.3	-	11.5
3	FRDR	83	0.0	0.0	9.6	3.6	0.0	7.2	0.0	2.4	11.5
3	GLRD	4	25.0	0.0	25.0	25.0	0.0	0.0	25.0	50.0	1.0
3	GOLD	47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	MOON	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	NRPK	13	0.0	0.0	0.0	0.0	0.0	7.7	0.0	0.0	0.0
3	QUIL	120	2.5	1.7	20.8	4.2	1.7	0.0	9.2	30.8	32.3
3	RCBS	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	SAUG	170	0.6	1.2	0.0	0.6	0.6	4.1	0.0	0.0	3.1
3	SHRD	44	0.0	0.0	2.3	6.8	0.0	4.5	0.0	22.7	4.2
3	SLRD	4	0.0	0.0	25.0	0.0	0.0	0.0	0.0	25.0	1.0
3	STCT	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	WALL	8	0.0	0.0	0.0	12.5	0.0	12.5	0.0	0.0	1.0
3	WHSC	133	2.3	1.5	6.8	10.5	3.0	13.5	13.5	4.5	27.1
3	Total	1037	1.0	1.0	4.7	3.7	0.9	12.2	3.2	5.7	100.0

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly (%)							% of DELTs	
			Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Scale Hemmorhaging Disorientation		
3A	BGBF	0	-	-	-	-	-	-	-	-	-
3A	BLBL	0	-	-	-	-	-	-	-	-	-
3A	BLCR	0	-	-	-	-	-	-	-	-	-
3A	BRBL	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3A	BURB	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0
3A	CARP	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3A	CHCT	0	-	-	-	-	-	-	-	-	-
3A	FRDR	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3A	GLRD	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
3A	GOLD	26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3A	MOON	0	-	-	-	-	-	-	-	-	-
3A	NRPK	0	-	-	-	-	-	-	-	-	-
3A	QUIL	0	-	-	-	-	-	-	-	-	-
3A	RCBS	0	-	-	-	-	-	-	-	-	-
3A	SAUG	122	0.0	0.0	0.0	0.8	0.0	4.1	0.0	0.0	100.0
3A	SHRD	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3A	SLRD	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3A	STCT	0	-	-	-	-	-	-	-	-	-
3A	WALL	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3A	WHSC	3	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0	0.0
3A	Total	167	0.0	0.0	0.0	0.6	0.0	3.6	0.6	0.0	100.0

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly (%)							% of DELTs	
			Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Scale Hemmorhaging Disorientation		
4	BGBF	3	0.0	0.0	33.3	0.0	0.0	0.0	33.3	0.0	1.1
4	BLBL	0	-	-	-	-	-	-	-	-	-
4	BLCR	1	0	0	0	0	0	0	0	0	0.0
4	BRBL	0	-	-	-	-	-	-	-	-	-
4	BURB	0	-	-	-	-	-	-	-	-	-
4	CARP	64	10.9	4.7	17.2	32.8	1.6	1.6	3.1	0.0	30.1
4	CHCT	77	0	3.9	5.2	2.6	1.3	26.0	6.5	-	10.8
4	FRDR	47	0.0	0.0	4.3	2.1	0.0	6.4	0.0	0.0	3.2
4	GLRD	23	0.0	0.0	13.0	4.3	0.0	0.0	0.0	26.1	4.3
4	GOLD	14	0.0	7.1	0.0	7.1	0.0	0.0	7.1	0.0	2.2
4	MOON	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	NRPK	0	-	-	-	-	-	-	-	-	-
4	QUIL	18	5.6	5.6	27.8	0.0	5.6	0.0	5.6	16.7	6.5
4	RCBS	0	-	-	-	-	-	-	-	-	-
4	SAUG	76	0.0	0.0	2.6	0.0	0.0	1.3	0.0	0.0	2.2
4	SHRD	248	0.4	1.6	1.2	8.1	1.2	4.0	0.4	36.3	31.2
4	SLRD	10	0.0	10.0	10.0	0.0	10.0	10.0	0.0	40.0	3.2
4	STCT	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	WALL	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0
4	WHSC	41	2.4	7.3	2.4	4.9	0.0	24.4	14.6	12.2	5.4
4	Total	633	1.6	2.5	5.2	7.6	1.1	7.3	2.7	17.2	100.0

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly (%)							% of DELTs	
			Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Scale Hemmorhaging		Disorientation
5	BGBF	0	-	-	-	-	-	-	-	-	-
5	BLBL	0	-	-	-	-	-	-	-	-	-
5	BLCR	0	-	-	-	-	-	-	-	-	-
5	BRBL	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	BURB	0	-	-	-	-	-	-	-	-	-
5	CARP	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	CHCT	17	0	0.0	0.0	5.9	0.0	5.9	0.0	-	5.9
5	FRDR	10	0.0	0.0	80.0	0.0	0.0	0.0	0.0	0.0	47.1
5	GLRD	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	GOLD	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	MOON	0	-	-	-	-	-	-	-	-	-
5	NRPK	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	QUIL	0	-	-	-	-	-	-	-	-	-
5	RCBS	0	-	-	-	-	-	-	-	-	-
5	SAUG	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	SHRD	21	0.0	4.8	9.5	9.5	0.0	14.3	0.0	23.8	29.4
5	SLRD	1	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	5.9
5	STCT	0	-	-	-	-	-	-	-	-	-
5	WALL	2	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	5.9
5	WHSC	3	0.0	0.0	33.3	0.0	0.0	0.0	33.3	0.0	5.9
5	Total	70	0.0	1.4	18.6	4.3	0.0	5.7	1.4	7.1	100.0

Table 2. - continued -

Zone	Species ¹	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly (%)								% of DELTs	
			Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation		
ALL	BGBF	6	0.0	0.0	16.7	0.0	0.0	0.0	0.0	16.7	0.0	0.4
ALL	BLBL	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALL	BLCR	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALL	BRBL	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALL	BURB	24	0.0	0.0	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4
ALL	CARP	137	5.8	3.6	8.0	19.7	0.7	3.6	2.9	2.2	12.7	12.7
ALL	CHCT	804	0.2	0.6	1.4	1.9	1.0	44.7	1.1	0.0	13.5	13.5
ALL	FRDR	168	0.6	0.0	12.5	3.0	0.0	7.1	0.0	1.8	9.1	9.1
ALL	GLRD	35	2.9	0.0	11.4	5.7	0.0	0.0	5.7	22.9	1.8	1.8
ALL	GOLD	190	0.0	1.1	0.0	1.1	0.0	0.5	2.6	0.5	1.5	1.5
ALL	MOON	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALL	NRPK	21	0.0	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.0	0.0
ALL	QUIL	186	2.2	1.6	21.0	4.8	1.6	0.5	7.5	24.7	18.2	18.2
ALL	RCBS	3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.4	0.4
ALL	SAUG	560	0.4	0.4	2.3	0.7	0.2	3.8	0.0	0.0	6.5	6.5
ALL	SHRD	362	0.3	1.4	2.2	7.7	1.1	4.7	0.3	30.9	16.0	16.0
ALL	SLRD	24	0.0	4.2	12.5	4.2	4.2	8.3	0.0	20.8	2.2	2.2
ALL	STCT	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALL	WALL	45	0.0	0.0	4.4	2.2	0.0	2.2	2.2	2.2	1.1	1.1
ALL	WHSC	247	3.2	2.0	7.3	9.7	2.4	13.4	10.5	6.9	16.4	16.4
ALL	Total	2834	1.0	1.0	4.7	4.2	0.8	16.0	2.2	6.9	100.0	100.0

Table 3. Numbers and frequencies of DELTs and other anomalies observed on fish captured in the Red (zones 1, 2, 3, and 3A) and Assiniboine (zones 4 and 5) rivers, July through October 1999. ¹ Species codes are presented in Appendix 3.

Species ¹	Total Number of Fish Captured (n)	One DELT		Number of fish with DELT or other anomaly								
		Number of fish	Frequency (%)	Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	
Assiniboine River (zones 4 and 5)												
BGBF	3	1	33.3	0	0	1	0	0	0	0	1	0
BLBL	0	0	0.0	0	0	0	0	0	0	0	0	0
BLCR	1	0	0.0	0	0	0	0	0	0	0	0	0
BRBL	1	0	0.0	0	0	0	0	0	0	0	0	0
BURB	0	-	-	-	-	-	-	-	-	-	-	-
CARP	66	28	42.4	7	3	11	21	1	1	2	0	
CHCT	94	11	11.7	0	3	4	3	1	21	5	-	
FRDR	57	11	19.3	0	0	10	1	0	3	0	0	
GLRD	25	4	16.0	0	0	3	1	0	0	0	6	
GOLD	17	2	11.8	0	1	0	1	0	0	0	0	
MOON	2	0	0.0	0	0	0	0	0	0	0	0	
NRPK	3	0	0	0	0	0	0	0	0	0	0	
QUIL	18	6	33.3	1	1	5	0	1	0	1	3	
RCBS	0	-	-	-	-	-	-	-	-	-	-	
SAUG	81	2	2.5	0	0	2	0	0	1	0	0	
SHRD	269	34	12.6	1	5	5	22	3	13	1	95	
SLRD	11	4	36.4	0	1	2	0	1	1	0	4	
STCT	1	0	0.0	0	0	0	0	0	0	0	0	
WALL	10	1	10.0	0	0	1	0	0	0	0	1	
WHSC	44	6	13.6	1	3	2	2	0	10	7	5	
Total	703	110	15.6	10	17	46	51	7	50	17	114	
% of DELTs				8.3	14.0	38.0	42.1	5.8				

Table 3. - continued -

Species ¹	Total Number of Fish Captured (n)		Number of fish with DELT or other anomaly									
	One DELT		Number of fish	Frequency (%)	Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
Red River (zones 1, 2, 3, and 3A)												
BGBF	2	0	0.0	0	0	0	0	0	0	0	0	0
BLBL	3	0	0.0	0	0	0	0	0	0	0	0	0
BLCR	3	0	0.0	0	0	0	0	0	0	0	0	0
BRBL	5	0	0.0	0	0	0	0	0	0	0	0	0
BURB	24	1	4.2	0	0	1	0	0	0	0	0	-
CARP	70	7	10.0	1	2	0	6	0	4	2	2	2
CHCT	710	26	3.7	2	2	7	12	7	338	4	-	-
FRDR	111	14	12.6	1	0	11	4	0	9	0	3	3
GLRD	10	1	10.0	1	0	1	1	0	0	2	2	2
GOLD	130	1	0.8	0	0	0	1	0	0	3	1	1
MOON	2	0	0.0	0	0	0	0	0	0	0	0	0
NRPK	18	0	0.0	0	0	0	0	0	1	0	0	0
QUIL	168	44	26.2	3	2	34	9	2	1	13	43	43
RCBS	3	1	33.3	0	0	0	1	0	0	0	0	0
SAUG	477	16	3.4	2	2	11	4	1	20	0	0	0
SHRD	91	10	11.0	0	0	3	6	1	4	0	17	17
SLRD	12	2	16.7	0	0	1	1	0	0	0	1	1
STCT	4	0	0.0	0	0	0	0	0	0	0	0	0
WALL	34	2	5.9	0	0	1	1	0	1	1	0	0
WHSC	203	39	19.2	7	2	16	22	6	23	19	12	12
Total	2080	164	7.9	17	10	86	68	17	401	44	81	81
% of DELTs				9.4	5.5	47.5	37.6	9.4				

Table 3. - continued -

Species ¹	Total Number of Fish Captured (n)	One DELT		Number of fish with DELT or other anomaly								
		Number of fish	Frequency (%)	Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	
Red and Assiniboine rivers												
BGBF	5	1	20.0	0	0	1	0	0	0	0	1	0
BLBL	3	0	0.0	0	0	0	0	0	0	0	0	0
BLCR	4	0	0.0	0	0	0	0	0	0	0	0	0
BRBL	6	0	0.0	0	0	0	0	0	0	0	0	0
BURB	24	1	4.2	0	0	1	0	0	0	0	0	-
CARP	136	35	25.7	8	5	11	27	1	5	4	2	2
CHCT	804	37	4.6	2	5	11	15	8	359	9	-	-
FRDR	168	25	14.9	1	0	21	5	0	12	0	3	3
GLRD	35	5	14.3	1	0	4	2	0	0	2	8	8
GOLD	147	3	2.0	0	1	0	2	0	0	3	1	1
MOON	4	0	0.0	0	0	0	0	0	0	0	0	0
NRPK	21	0	0.0	0	0	0	0	0	1	0	0	0
QUIL	186	50	26.9	4	3	39	9	3	1	14	46	46
RCBS	3	1	33.3	0	0	0	1	0	0	0	0	0
SAUG	558	18	3.2	2	2	13	4	1	21	0	0	0
SHRD	360	44	12.2	1	5	8	28	4	17	1	112	112
SLRD	23	6	26.1	0	1	3	1	1	1	0	5	5
STCT	5	0	0.0	0	0	0	0	0	0	0	0	0
WALL	44	3	6.8	0	0	2	1	0	1	1	1	1
WHSC	247	45	18.2	8	5	18	24	6	33	26	17	17
Total	2783	274	9.8	27	27	132	119	24	451	61	195	195
% of DELTS				8.9	8.9	43.6	39.3	7.9				

Table 3. - continued -

Species ¹	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly (%)								% of DELTs
		Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	
Assiniboine River (zones 4 and 5)										
BGBF	3	0.0	0.0	33.3	0.0	0.0	0.0	33.3	0.0	0.9
BLBL	0	-	-	-	-	-	-	-	-	-
BLCR	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BRBL	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BURB	0	-	-	-	-	-	-	-	-	-
CARP	66	10.6	4.5	16.7	31.8	1.5	1.5	3.0	0.0	25.5
CHCT	94	0.0	3.2	4.3	3.2	1.1	22.3	5.3	-	10.0
FRDR	57	0.0	0.0	17.5	1.8	0.0	5.3	0.0	0.0	10.0
GLRD	25	0.0	0.0	12.0	4.0	0.0	0.0	0.0	24.0	3.6
GOLD	17	0.0	5.9	0.0	5.9	0.0	0.0	0.0	0.0	1.8
MOON	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NRPK	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
QUIL	18	5.6	5.6	27.8	0.0	5.6	0.0	5.6	16.7	5.5
RCBS	0	-	-	-	-	-	-	-	-	-
SAUG	81	0.0	0.0	2.5	0.0	0.0	1.2	0.0	0.0	1.8
SHRD	269	0.4	1.9	1.9	8.2	1.1	4.8	0.4	35.3	30.9
SLRD	11	0.0	9.1	18.2	0.0	9.1	9.1	0.0	36.4	3.6
STCT	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WALL	10	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.9
WHSC	44	2.3	6.8	4.5	4.5	0.0	22.7	15.9	11.4	5.5
Total	703	1.4	2.4	6.5	7.3	1.0	7.1	2.4	16.2	100.0

Table 3. - continued -

Species ¹	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly (%)								% of DELTs	
		Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation		
Red River (zones 1, 2, 3, and 3A)											
BGBF	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BLBL	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BLCR	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BRBL	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BURB	24	0.0	0.0	4.2	0.0	0.0	0.0	0.0	0.0	-	0.6
CARP	70	1.4	2.9	0.0	8.6	0.0	5.7	2.9	2.9	2.9	4.3
CHCT	710	0.3	0.3	1.0	1.7	1.0	47.6	0.6	-	-	15.9
FRDR	111	0.9	0.0	9.9	3.6	0.0	8.1	0.0	2.7	2.7	8.5
GLRD	10	10.0	0.0	10.0	10.0	0.0	0.0	20.0	20.0	20.0	0.6
GOLD	130	0.0	0.0	0.0	0.8	0.0	0.0	2.3	0.8	0.8	0.6
MOON	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NRPK	18	0.0	0.0	0.0	0.0	0.0	5.6	0.0	0.0	0.0	0.0
QUIL	168	1.8	1.2	20.2	5.4	1.2	0.6	7.7	25.6	25.6	26.8
RCBS	3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.6
SAUG	477	0.4	0.4	2.3	0.8	0.2	4.2	0.0	0.0	0.0	9.8
SHRD	91	0.0	0.0	3.3	6.6	1.1	4.4	0.0	18.7	18.7	6.1
SLRD	12	0.0	0.0	8.3	8.3	0.0	0.0	0.0	8.3	8.3	1.2
STCT	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WALL	34	0.0	0.0	2.9	2.9	0.0	2.9	2.9	2.9	0.0	1.2
WHSC	203	3.4	1.0	7.9	10.8	3.0	11.3	9.4	5.9	5.9	23.8
Total	2080	0.8	0.5	4.1	3.3	0.8	19.3	2.1	3.9	3.9	100.0

Table 3. - continued -

Species ¹	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly (%)								% of DELTs
		Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	
Red and Assiniboine rivers										
BGBF	5	0.0	0.0	20.0	0.0	0.0	0.0	20.0	0.0	0.4
BLBL	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BLCR	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BRBL	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BURB	24	0.0	0.0	4.2	0.0	0.0	0.0	0.0	-	0.4
CARP	136	5.9	3.7	8.1	19.9	0.7	3.7	2.9	1.5	12.8
CHCT	804	0.2	0.6	1.4	1.9	1.0	44.7	1.1	-	13.5
FRDR	168	0.6	0.0	12.5	3.0	0.0	7.1	0.0	1.8	9.1
GLRD	35	2.9	0.0	11.4	5.7	0.0	0.0	5.7	22.9	1.8
GOLD	147	0.0	0.7	0.0	1.4	0.0	0.0	2.0	0.7	1.1
MOON	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NRPK	21	0.0	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.0
QUIL	186	2.2	1.6	21.0	4.8	1.6	0.5	7.5	24.7	18.2
RCBS	3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.4
SAUG	558	0.4	0.4	2.3	0.7	0.2	3.8	0.0	0.0	6.6
SHRD	360	0.3	1.4	2.2	7.8	1.1	4.7	0.3	31.1	16.1
SLRD	23	0.0	4.3	13.0	4.3	4.3	4.3	0.0	21.7	2.2
STCT	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WALL	44	0.0	0.0	4.5	2.3	0.0	2.3	0.0	2.3	1.1
WHSC	247	3.2	2.0	7.3	9.7	2.4	13.4	10.5	6.9	16.4
Total	2783	1.0	1.0	4.7	4.3	0.9	16.2	2.2	7.0	100.0

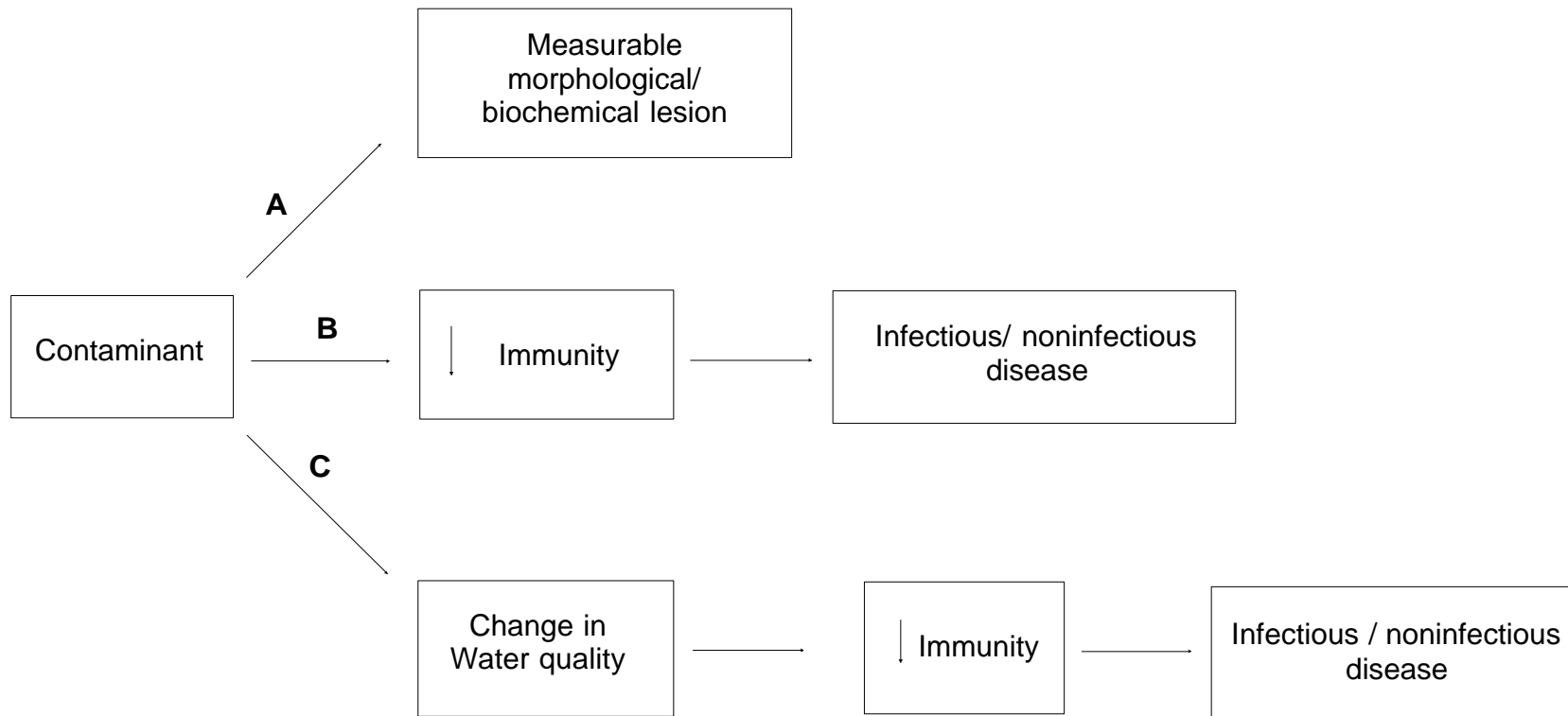


Figure 1. Pathways of disease acquisition in aquatic biota. (A) Direct effect of a contaminant causing morphological or biochemical alteration; (B) Indirect effect of a contaminant on fish disease condition via direct contaminant-induced immunosuppression; and, (C) Indirect effect of a contaminant on immunity and disease condition via effects on water quality. (After Noga 1988)

- NEWPCC - North End Water Pollution Control Centre
- SEWPCC - South End Water Pollution Control Centre
- WEWPCC - West End Water Pollution Control Centre
- - Study Area

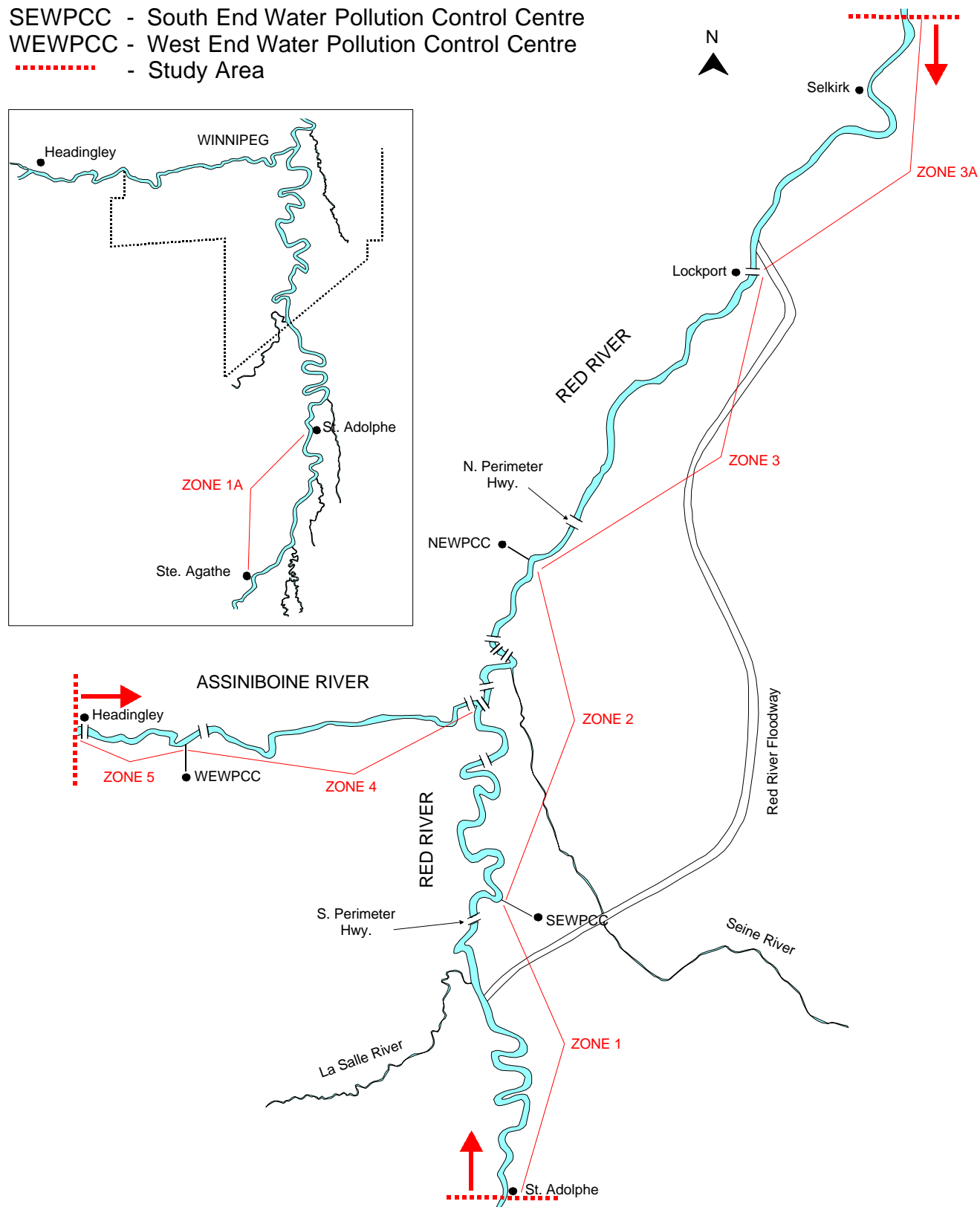


Figure 2. Study area for the City of Winnipeg Ammonia Criteria Study.

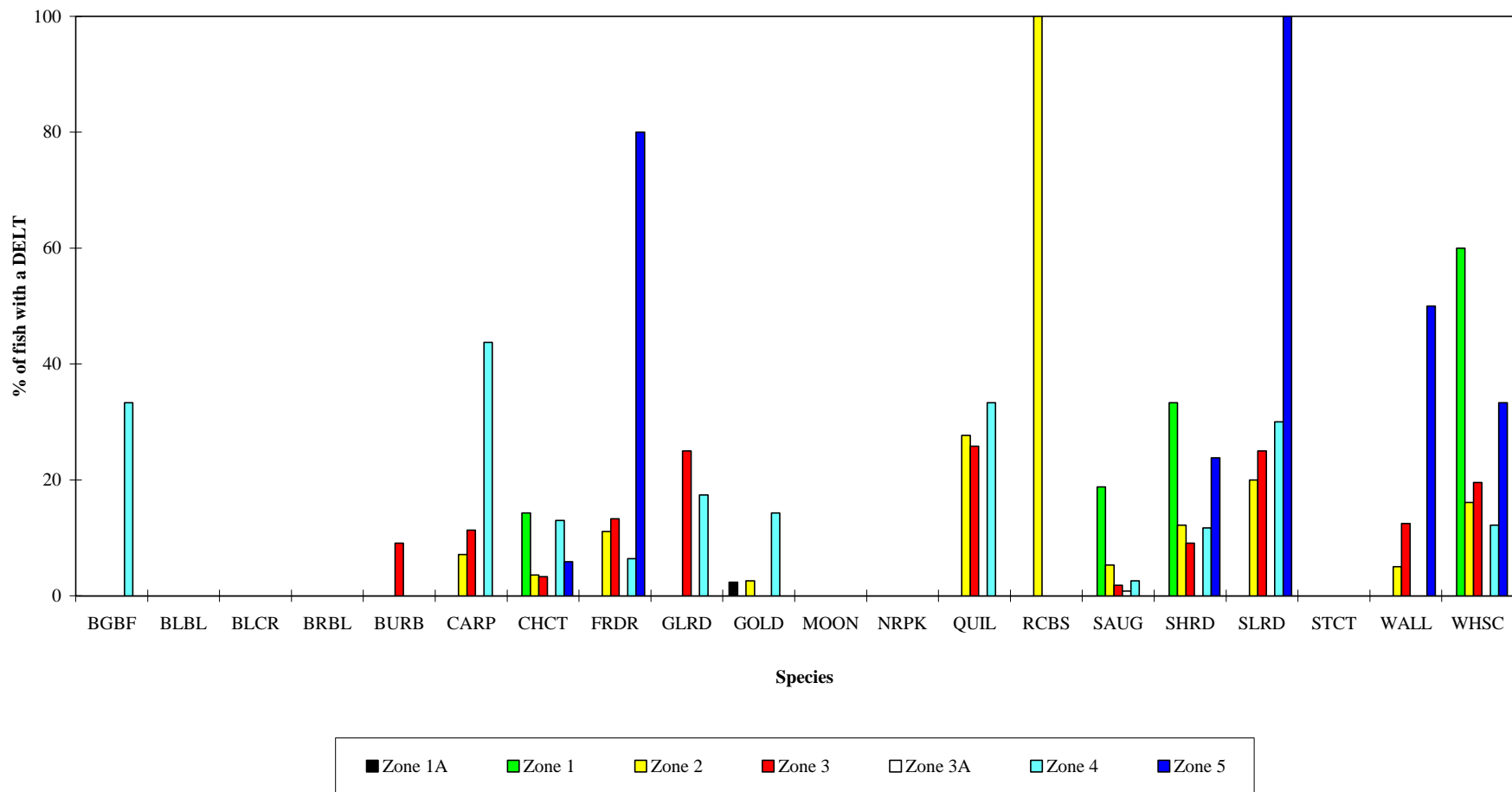


Figure 3. Frequencies of DELTs in fish species captured in the Red (Zones 1A, 1, 2, 3, and 3A) and Assiniboine (Zones 4 and 5) rivers, according to zone, July through October 1999.

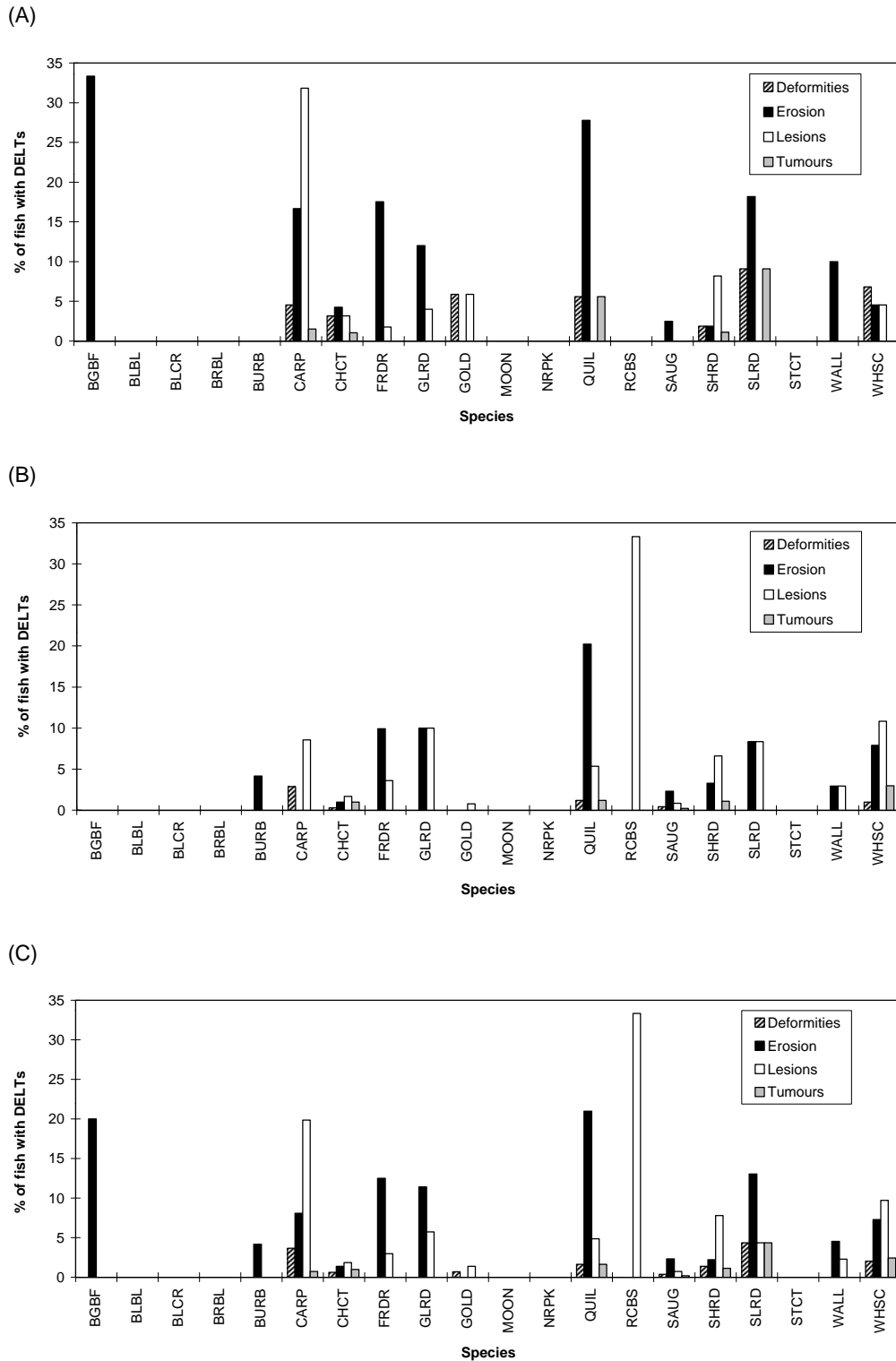


Figure 4. Percentages of fish with deformities, erosion, lesions, or tumours (DELTs), according to species, captured in (A) the Assiniboine River (zones 4 and 5), (B) the Red River (zones 1, 2, 3, and 3A), and (C) the Assiniboine and Red rivers combined (zones 1 - 5 and 3A), July through October 1999.

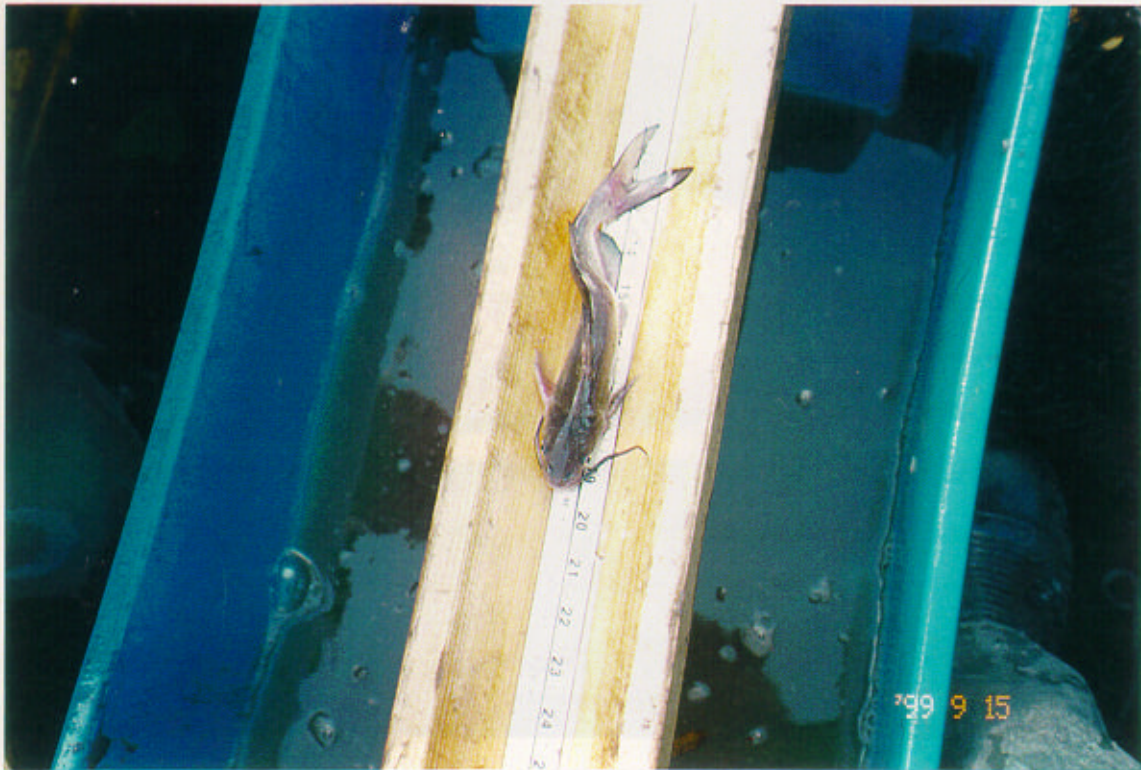


Figure 5. Lateral curvature of the spine in a channel catfish captured in zone 3, Fall 1999.



Figure 6. A sauger captured in zone 3, fall 1999, with a tumour on the left opercle and a deformed left pectoral fin.



Figure 7. Quillback captured in zone 2, fall 1999, exhibiting fin erosion, most notable on the caudal fin, and scale disorientation.



Figure 8. Quillback captured in zone 4, July 1999, exhibiting scale disorientation, a tumour at the base of the left pectoral fin, and a deformed left pectoral fin.



Figure 9. Tumour on the lower lip of a shorthead redhorse captured in Omand's Creek (zone 4), July 1999. Scale disorientation was also present on this individual (not shown).



Figure 10. Tumour on the lower lip of a silver redhorse captured in Omand's Creek (zone 4), July 1999.



Figure 11. White sucker captured in zone 4, fall 1999, exhibiting haemorrhaging of the pectoral and pelvic fins.



Figure 12. Silver redhorse captured in zone 4, July 1999, exhibiting extensive scale disorientation.



Figure 14. White sucker captured in zone 3, July 1999, with a deformed right pelvic fin.
Figure 13. Channel catfish captured in zone 1, fall 1999, exhibiting a heavy external parasite infestation on the fins.



Figure 14. White sucker captured in zone 3, July 1999, with a deformed right pelvic fin and haemorrhaging of the pectoral, pelvic, and anal fins.

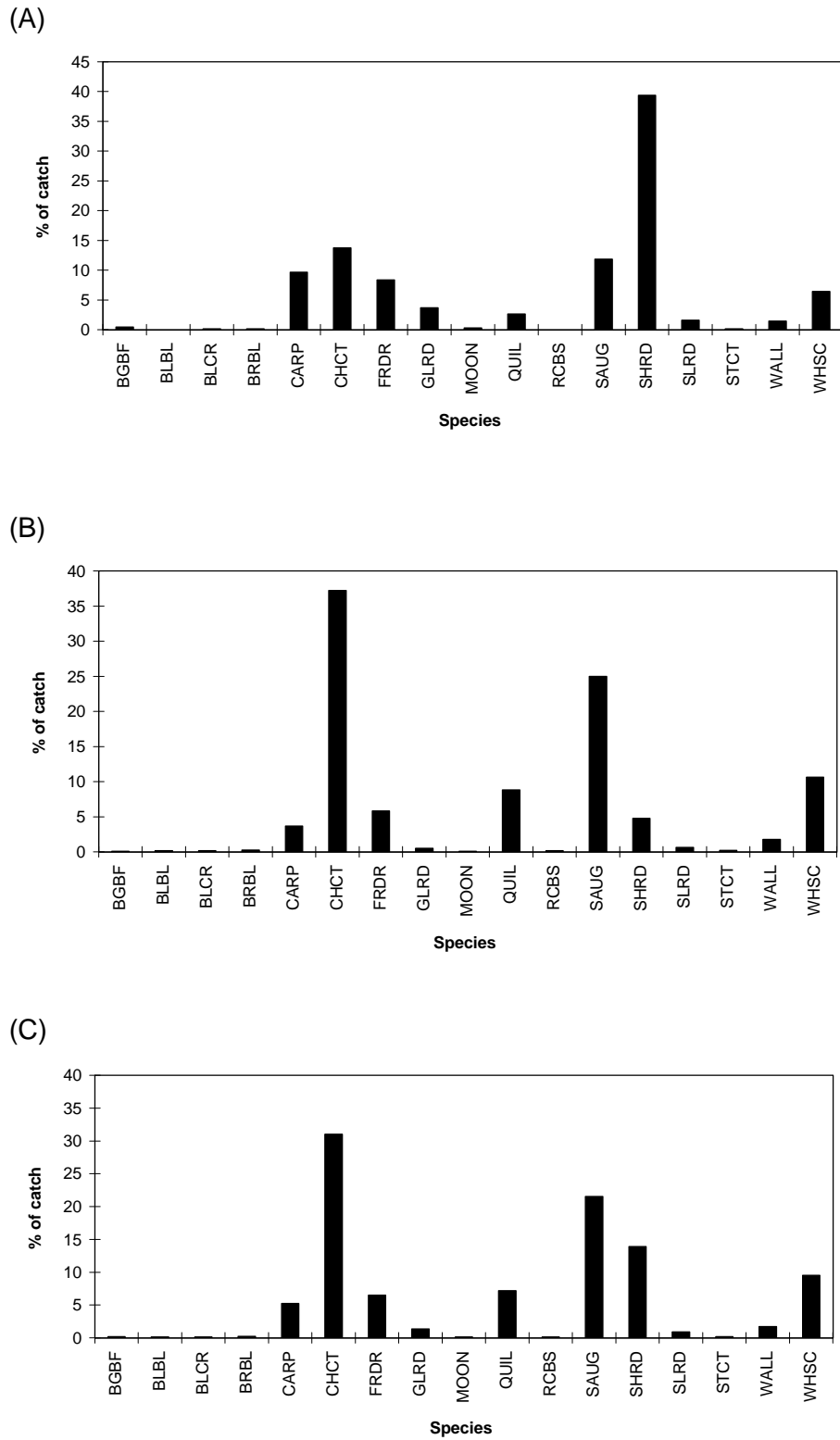


Figure 15. Relative abundance of fish species captured in the (A) Assiniboine River (zones 4 and 5), (B) Red River (zones 1, 2, 3, and 3A), and (C) Red and Assiniboine rivers combined (zones 1 - 5 and 3A)

APPENDICES

Appendix 1. Number and frequencies of DELTs observed on bigmouth buffalo captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A1-1. Numbers and frequencies of DELTs and other anomalies in bigmouth buffalo captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT								
			One DELTA	Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River	Winter (February and March)	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	0	-	-	-	-	-	-	-	-	-
Assiniboine River		1	0	0	0	0	0	0	0	0	0
Red River	August	0	-	-	-	-	-	-	-	-	-
Assiniboine River		1	0	0	0	0	0	0	0	1	0
Red River	September	2	0	0	0	0	0	0	0	0	0
Assiniboine River		1	1	0	0	1	0	0	0	0	0
Red River	October	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	2	0	0	0	0	0	0	0	0	0
Assiniboine River		3	1	0	0	1	0	0	0	1	0
Red and Assiniboine rivers	July - October	5	1	0	0	1	0	0	0	1	0

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A1-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								Scale Disorientation
			One DELT	Multiple	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	
Red River	Winter (February and March)	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	0	-	-	-	-	-	-	-	-	-
Assiniboine River		1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red River	August	0	-	-	-	-	-	-	-	-	-
Assiniboine River		1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Red River	September	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Assiniboine River		1	100.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Red River	October	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Assiniboine River		3	33.3	0.0	0.0	33.3	0.0	0.0	0.0	33.3	0.0
Red and Assiniboine rivers	July - October	5	20.0	0.0	0.0	20.0	0.0	0.0	0.0	20.0	0.0

Table A1-4. Numbers and frequencies of DELTs and other anomalies in bigmouth buffalo captured in the Red and Assiniboine rivers, according to zone, August.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 3	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	1	0	0	0	0	0	0	0	1	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1	0	0	0	0	0	0	0	1	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0

Table A1-5. Numbers and frequencies of DELTs in bigmouth buffalo captured in the Red and Assiniboine rivers, according to zone, September.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale disorientation
		Zone 1A	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 1	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 3	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	1	1	0	0	1	0	0	0	0	0	100.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	4	1	0	0	1	0	0	0	0	0	25.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0

Table A1-6. Numbers and frequencies of DELTs and other anomalies in bigmouth buffalo captured in the Red and Assiniboine rivers, according to zone, July through September. No fish were captured in October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale disorientation
		Zone 1A	1	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 1	2	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 3	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	3	1	0	0	1	0	0	0	1	0	33.3	0.0	0.0	33.3	0.0	0.0	0.0	33.3	0.0
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	6	1	0	0	1	0	0	0	1	0	16.7	0.0	0.0	16.7	0.0	0.0	0.0	16.7	0.0

Appendix 2. Number and frequencies of DELTs observed on black bullhead captured in the Red and Assiniboine rivers, according to month, river and zone.

Appendix 3. Number and frequencies of DELTs observed on black crappie captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A3-1. Numbers and frequencies of DELTs and other anomalies in black crappie captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River	Winter (February and March)	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	0	-	-	-	-	-	-	-	-	-
Assiniboine River		1	0	0	0	0	0	0	0	0	0
Red River	August	1	0	0	0	0	0	0	0	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	September	1	0	0	0	0	0	0	0	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	October	1	0	0	0	0	0	0	0	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	3	0	0	0	0	0	0	0	0	0
Assiniboine River		1	0	0	0	0	0	0	0	0	0
Red and Assiniboine rivers	July - October	4	0	0	0	0	0	0	0	0	0

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Appendix 4. Number and frequencies of DELTs observed on brown bullhead captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A4-1. Numbers and frequencies of DELTs and other anomalies in brown bullhead captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River	Winter (February and March)	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	1	0	0	0	0	0	0	0	0	0
Assiniboine River		1	0	0	0	0	0	0	0	0	0
Red River	August	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	September	4	0	0	0	0	0	0	0	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	October	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	5	0	0	0	0	0	0	0	0	0
Assiniboine River		1	0	0	0	0	0	0	0	0	0
Red and Assiniboine rivers	July - October	6	0	0	0	0	0	0	0	0	0

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Appendix 5. Number and frequencies of DELTs observed on burbot captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A5-1. Numbers and frequencies of DELTs and other anomalies in burbot captured in the Red River, according to season. Note that burbot were not captured in the Assiniboine River. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	Parasites	Hemorrhaging	Scale Disorientation
Winter (February and March)	1	0	0	0	0	0	0	0	0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
July	14	0	0	0	0	0	0	0	0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
August	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
September	6	1	0	0	1	0	0	0	0	-	16.7	0.0	0.0	16.7	0.0	0.0	0.0	0.0	-
October	4	0	0	0	0	0	0	0	0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
July - October	24	1	0	0	1	0	0	0	0	-	4.2	0.0	0.0	4.2	0.0	0.0	0.0	0.0	-
July - September	20	1	0	0	1	0	0	0	0	-	5.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	-
September and October	10	1	0	0	1	0	0	0	0	-	10.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	-

Table A5-4. Numbers and frequencies of DELTs and other anomalies in burbot captured in the Red River, according to zone, September.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT		Multiple DELTs		External			Scale		One DELT		Multiple DELTs		External			Scale	
		DELT	DELTs	Deformities	Erosion	Lesions	Tumours	Parasites	Hemmorhaging	disorientation	DELT	DELTs	Deformities	Erosion	Lesions	Tumours	Parasites	Hemmorhaging	disorientation
Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 2	3	0	0	0	0	0	0	0	0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Zone 3	3	1	0	0	1	0	0	0	0	-	33.3	0.0	0.0	33.3	0.0	0.0	0.0	0.0	-
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	6	1	0	0	1	0	0	0	0	-	16.7	0.0	0.0	16.7	0.0	0.0	0.0	0.0	-

Table A5-6. Numbers and frequencies of DELTs and other anomalies in burbot captured in the Red River, according to zone, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	11	0	0	0	0	0	0	0	0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 3	11	1	0	0	1	0	0	0	0	-	9.1	0.0	0.0	9.1	0.0	0.0	0.0	0.0	
Zone 3A	2	0	0	0	0	0	0	0	0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	24	1	0	0	1	0	0	0	0	-	4.2	0.0	0.0	4.2	0.0	0.0	0.0	0.0	

Appendix 6. Number and frequencies of DELTs observed on carp captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A6-1. Numbers and frequencies of DELTs and other anomalies in carp captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
Red River	Winter (February and March)	5	3	0	1	1	1	0	0	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	35	5	1	2	0	4	0	2	0	1
Assiniboine River		34	24	6	2	10	18	1	0	2	0
Red River	August	11	0	0	0	0	0	0	0	0	1
Assiniboine River		2	0	0	0	0	0	0	0	0	0
Red River	September	19	2	0	0	0	2	0	1	1	0
Assiniboine River		30	4	1	1	1	3	0	1	0	0
Red River	October	5	0	0	0	0	0	0	1	1	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	70	7	1	2	0	6	0	4	2	2
Assiniboine River		66	28	7	3	11	21	1	1	2	0
Red and Assiniboine rivers	July - October	136	35	8	5	11	27	1	5	4	2

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A6-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River Assiniboine River	Winter (February and March)	5 0	60.0 -	0.0 -	20.0 -	20.0 -	20.0 -	0.0 -	0.0 -	0.0 -	0.0 -
Red River Assiniboine River	July	35 34	14.3 70.6	2.9 17.6	5.7 5.9	0.0 29.4	11.4 52.9	0.0 2.9	5.7 0.0	0.0 5.9	2.9 0.0
Red River Assiniboine River	August	11 2	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	9.1 0.0
Red River Assiniboine River	September	19 30	10.5 13.3	0.0 3.3	0.0 3.3	0.0 3.3	10.5 10.0	0.0 0.0	5.3 3.3	5.3 0.0	0.0 0.0
Red River Assiniboine River	October	5 0	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	20.0 -	20.0 -	0.0 -
Red River Assiniboine River	July - October	70 66	10.0 42.4	1.4 10.6	2.9 4.5	0.0 16.7	8.6 31.8	0.0 1.5	5.7 1.5	2.9 3.0	2.9 0.0
Red and Assiniboine rivers	July - October	136	25.7	5.9	3.7	8.1	19.9	0.7	3.7	2.9	1.5

Table A6-2. Numbers and frequencies of DELTs and other anomalies in carp captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Winter (February and March)	5	3	0	1	1	1	0	0	0	0	60.0	0.0	20.0	20.0	20.0	0.0	0.0
July	69	29	7	4	10	22	1	2	2	1	42.0	10.1	5.8	14.5	31.9	1.4	2.9	2.9	1.4
August	13	0	0	0	0	0	0	0	0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7
September	49	6	1	1	1	5	0	2	1	0	12.2	2.0	2.0	2.0	10.2	0.0	4.1	2.0	0.0
October	5	0	0	0	0	0	0	1	1	0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0
July - October	136	35	8	5	11	27	1	5	4	2	25.7	5.9	3.7	8.1	19.9	0.7	3.7	2.9	1.5

Table A6-3. Numbers and frequencies of DELTs and other anomalies in carp captured in the Red and Assiniboine rivers, according to zone, February and March.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	4	3	0	1	1	1	0	0	0	0	75.0	0.0	25.0	25.0	25.0	0.0	0.0	0.0	0.0
Zone 2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 3	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 3A	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	5	3	0	1	1	1	0	0	0	0	60.0	0.0	20.0	20.0	20.0	0.0	0.0	0.0	0.0

Table A6-4. Numbers and frequencies of DELTs and other anomalies in carp captured in the Red and Assiniboine rivers, according to zone, July.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	8	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 3	24	5	1	2	0	4	0	2	0	1	20.8	4.2	8.3	0.0	16.7	0.0	8.3	0.0	
Zone 3A	3	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 4	33	24	6	2	10	18	1	0	2	0	72.7	18.2	6.1	30.3	54.5	3.0	0.0	6.1	
Zone 5	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total	69	29	7	4	10	22	1	2	2	1	42.0	10.1	5.8	14.5	31.9	1.4	2.9	2.9	

Table A6-6. Numbers and frequencies of DELTs and other anomalies in carp captured in the Red and Assiniboine rivers, according to zone, September.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	1	0	0	0	0	0	0	0	0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 2	4	1	0	0	0	1	0	1	0	0	25.0	0.0	0.0	0.0	25.0	0.0	25.0	0.0	0.0
Zone 3	15	1	0	0	0	1	0	0	1	0	6.7	0.0	0.0	0.0	6.7	0.0	0.0	6.7	0.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	29	4	1	1	1	3	0	1	0	0	13.8	3.4	3.4	3.4	10.3	0.0	3.4	0.0	0.0
Zone 5	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	50	6	1	1	1	5	0	2	1	1	12.0	2.0	2.0	2.0	10.0	0.0	4.0	2.0	2.0

Table A6-7. Numbers and frequencies of DELTs and other anomalies in carp captured in the Red and Assiniboine rivers, according to zone, October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One		Multiple		External			Scale		One		Multiple		External			Scale	
		DELT	DELTs	Deformities	Erosion	Lesions	Tumours	Parasites	Hemmorhaging	Disorientation	DELT	DELTs	Deformities	Erosion	Lesions	Tumours	Parasites	Hemmorhaging	Disorientation
Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 2	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	4	0	0	0	0	0	0	1	1	0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	25.0	0.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	5	0	0	0	0	0	0	1	1	0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	20.0	0.0

Table A6-8. Numbers and frequencies of DELTs and other anomalies in carp captured in the Red and Assiniboine rivers, according to zone, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	1	0	0	0	0	0	0	0	0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 2	14	1	0	0	0	1	0	1	0	1	7.1	0.0	0.0	0.0	7.1	0.0	7.1	0.0	7.1
Zone 3	53	6	1	2	0	5	0	3	2	1	11.3	1.9	3.8	0.0	9.4	0.0	5.7	3.8	1.9
Zone 3A	3	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4	64	28	7	3	11	21	1	1	2	0	43.8	10.9	4.7	17.2	32.8	1.6	1.6	3.1	0.0
Zone 5	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	137	35	8	5	11	27	1	5	4	3	25.5	5.8	3.6	8.0	19.7	0.7	3.6	2.9	2.2

Appendix 7. Number and frequencies of DELTs observed on channel catfish captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A7-1. Numbers and frequencies of DELTs and other anomalies in channel catfish captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								Scale
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	
Red River	Winter (February and March)	3	1	0	0	1	0	0	2	0	-
		Assiniboine River	0	-	-	-	-	-	-	-	-
Red River	July	29	2	0	0	0	1	1	3	0	-
		Assiniboine River	10	3	0	1	0	2	0	0	0
Red River	August	293	3	0	1	0	1	1	52	1	-
		Assiniboine River	36	6	0	2	3	0	1	3	3
Red River	September	135	8	0	1	1	6	0	60	1	-
		Assiniboine River	48	2	0	0	1	1	0	18	2
Red River	October	253	13	2	0	6	4	5	223	2	-
		Assiniboine River	0	-	-	-	-	-	-	-	-
Red River	July - October	710	26	2	2	7	12	7	338	4	-
		Assiniboine River	94	11	0	3	4	3	1	21	5
Red and Assiniboine rivers	July - October	804	37	2	5	11	15	8	359	9	-

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A7-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
Red River Assiniboine River	Winter (February and March)	3	33.3	0.0	0.0	33.3	0.0	0.0	66.7	0.0	-
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	July	29	6.9	0.0	0.0	0.0	3.4	3.4	10.3	0.0	-
		10	30.0	0.0	10.0	0.0	20.0	0.0	0.0	0.0	-
Red River Assiniboine River	August	293	1.0	0.0	0.3	0.0	0.3	0.3	17.7	0.3	-
		36	16.7	0.0	5.6	8.3	0.0	2.8	8.3	8.3	-
Red River Assiniboine River	September	135	5.9	0.0	0.7	0.7	4.4	0.0	44.4	0.7	-
		48	4.2	0.0	0.0	2.1	2.1	0.0	37.5	4.2	-
Red River Assiniboine River	October	253	5.1	0.8	0.0	2.4	1.6	2.0	88.1	0.8	-
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	July - October	710	3.7	0.3	0.3	1.0	1.7	1.0	47.6	0.6	-
		94	11.7	0.0	3.2	4.3	3.2	1.1	22.3	5.3	-
Red and Assiniboine rivers	July - October	804	4.6	0.2	0.6	1.4	1.9	1.0	44.7	1.1	-

Table A7-2. Numbers and frequencies of DELTs and other anomalies in channel catfish captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Winter (February and March)	3	1	0	0	1	0	0	2	0	-	33.3	0.0	0.0	33.3	0.0	0.0	66.7	0.0	-
July	39	5	0	1	0	3	1	3	0	-	12.8	0.0	2.6	0.0	7.7	2.6	7.7	0.0	-
August	329	9	0	3	3	1	2	55	4	-	2.7	0.0	0.9	0.9	0.9	0.6	16.7	1.2	-
September	183	10	0	1	2	7	0	78	3	-	5.5	0.0	0.5	1.1	3.8	0.0	42.6	1.6	-
October	253	13	2	0	6	4	5	223	2	-	5.1	0.8	0.0	2.4	4.0	2.0	88.1	0.8	-
July - October	804	37	2	5	11	16	8	359	9	-	4.6	0.2	0.6	1.4	2.0	1.0	44.7	1.1	-

Table A7-3. Numbers and frequencies of DELTs and other anomalies in channel catfish captured in the Red and Assiniboine rivers, according to zone, February and March.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	1	1	0	0	1	0	0	1	0	-	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0	-
Zone 2	1	0	0	0	0	0	0	0	0	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Zone 3	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 3A	1	0	0	0	0	0	0	1	0	-	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	-
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	3	1	0	0	1	0	0	2	0	-	33.3	0.0	0.0	33.3	0.0	0.0	66.7	0.0	-

Table A7-4. Numbers and frequencies of DELTs and other anomalies in channel catfish captured in the Red and Assiniboine rivers, according to zone, July.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	2	0	0	0	0	0	0	1	0	-	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	-
Zone 2	22	2	0	0	0	1	1	2	0	-	9.1	0.0	0.0	0.0	4.5	4.5	9.1	0.0	-
Zone 3	5	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	9	2	0	1	0	1	0	0	0	-	22.2	0.0	11.1	0.0	11.1	0.0	0.0	0.0	-
Zone 5	1	1	0	0	0	1	0	0	0	-	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	-
Total	39	5	0	1	0	3	1	3	0	-	12.8	0.0	2.6	0.0	7.7	2.6	7.7	0.0	-

Table A7-5. Numbers and frequencies of DELTs and other anomalies in channel catfish captured in the Red and Assiniboine rivers, according to zone, August.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	20	0	0	0	0	0	0	6	0	-	0.0	0.0	0.0	0.0	0.0	0.0	30.0	0.0	
Zone 3	273	3	0	1	0	1	1	46	1	-	1.1	0.0	0.4	0.0	0.4	0.4	16.8	0.4	
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	36	6	0	2	3	0	1	3	3	-	16.7	0.0	5.6	8.3	0.0	2.8	8.3	8.3	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	329	9	0	3	3	1	2	55	4	-	2.7	0.0	0.9	0.9	0.3	0.6	16.7	1.2	

Table A7-6. Numbers and frequencies of DELTs and other anomalies in channel catfish captured in the Red and Assiniboine rivers, according to zone, September.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	12	2	0	0	0	2	0	10	0	-	16.7	0.0	0.0	0.0	16.7	0.0	83.3	0.0	-
Zone 2	78	3	0	0	0	3	0	21	1	-	3.8	0.0	0.0	0.0	3.8	0.0	26.9	1.3	-
Zone 3	45	3	0	1	1	1	0	29	0	-	6.7	0.0	2.2	2.2	2.2	0.0	64.4	0.0	-
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	32	2	0	0	1	1	0	17	2	-	6.3	0.0	0.0	3.1	3.1	0.0	53.1	6.3	-
Zone 5	16	0	0	0	0	0	0	1	0	-	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	-
Total	183	10	0	1	2	7	0	78	3	-	5.5	0.0	0.5	1.1	3.8	0.0	42.6	1.6	-

Table A7-7. Numbers and frequencies of DELTs and other anomalies in channel catfish captured in the Red and Assiniboine rivers, according to zone, October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	238	8	1	0	4	1	4	210	2	-	3.4	0.4	0.0	1.7	1.0	1.7	88.2	0.8	-
Zone 3	15	5	1	0	2	3	1	13	0	-	33.3	6.7	0.0	13.3	20.0	6.7	86.7	0.0	-
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	253	13	2	0	6	4	5	223	2	-	5.1	0.8	0.0	2.4	1.6	2.0	88.1	0.8	-

Table A7-8. Numbers and frequencies of DELTs and other anomalies in channel catfish captured in the Red and Assiniboine rivers, according to zone, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	14	2	0	0	0	2	0	11	0	-	14.3	0	0.0	0.0	14.3	0.0	78.6	0.0	-
Zone 2	358	13	1	0	4	5	5	239	3	-	3.6	0.3	0.0	1.1	1.4	1.4	66.8	0.8	-
Zone 3	338	11	1	2	3	5	2	88	1	-	3.3	0.3	0.6	0.9	1.5	0.6	26.0	0.3	-
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	77	10	0	3	4	2	1	20	5	-	13	0	3.9	5.2	2.6	1.3	26.0	6.5	-
Zone 5	17	1	0	0	0	1	0	1	0	-	5.9	0	0.0	0.0	5.9	0.0	5.9	0.0	-
Total	804	37	2	5	11	15	8	359	9	-	4.6	0.2	0.6	1.4	1.9	1.0	44.7	1.1	-

Appendix 8. Number and frequencies of DELTs observed on freshwater drum captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A8-1. Numbers and frequencies of DELTs and other anomalies in freshwater drum captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River	Winter (February and March)	3	1	0	0	0	1	0	0	0	0
		0	-	-	-	-	-	-	-	-	-
Assiniboine River	July	29	9	0	0	7	2	0	4	0	0
		15	8	0	0	8	0	0	1	0	0
Red River	August	47	0	0	0	0	0	0	0	0	0
		17	2	0	0	2	0	0	0	0	0
Assiniboine River	September	25	4	0	0	3	1	0	5	0	0
		25	1	0	0	0	1	0	2	0	0
Red River	October	10	1	1	0	1	1	0	0	0	3
		0	-	-	-	-	-	-	-	-	-
Assiniboine River	July - October	111	14	1	0	11	4	0	9	0	3
		57	11	0	0	10	1	0	3	0	0
Red and Assiniboine rivers	July - October	168	25	1	0	21	5	0	12	0	3

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A8-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River Assiniboine River	Winter (February and March)	3	33.3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	July	29	31.0	0.0	0.0	24.1	6.9	0.0	13.8	0.0	0.0
		15	53.3	0.0	0.0	53.3	0.0	0.0	6.7	0.0	0.0
Red River Assiniboine River	August	47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		17	11.8	0.0	0.0	11.8	0.0	0.0	0.0	0.0	0.0
Red River Assiniboine River	September	25	16.0	0.0	0.0	12.0	4.0	0.0	20.0	0.0	0.0
		25	4.0	0.0	0.0	0.0	4.0	0.0	8.0	0.0	0.0
Red River Assiniboine River	October	10	10.0	10.0	0.0	10.0	10.0	0.0	0.0	0.0	30.0
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	July - October	111	12.6	0.9	0.0	9.9	3.6	0.0	8.1	0.0	2.7
		57	19.3	0.0	0.0	17.5	1.8	0.0	5.3	0.0	0.0
Red and Assiniboine rivers	July - October	168	14.9	0.6	0.0	12.5	3.0	0.0	7.1	0.0	1.8

Table A8-2. Numbers and frequencies of DELTs and other anomalies in freshwater drum captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
Winter (February and March)	3	1	0	0	0	1	0	0	0	0	33.3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0
July	44	17	0	0	15	2	0	5	0	0	38.6	0.0	0.0	34.1	4.5	0.0	11.4	0.0	0.0
August	64	2	0	0	2	0	0	0	0	0	3.1	0.0	0.0	3.1	0.0	0.0	0.0	0.0	0.0
September	50	5	0	0	3	2	0	7	0	0	10.0	0.0	0.0	6.0	4.0	0.0	14.0	0.0	0.0
October	10	1	1	0	1	1	0	0	0	3	10.0	10.0	0.0	10.0	10.0	0.0	0.0	0.0	30.0
July - October	168	25	1	0	21	5	0	12	0	3	14.9	0.6	0.0	12.5	3.0	0.0	7.1	0.0	1.8
September and October	60	6	1	0	4	3	0	7	0	3	10.0	1.7	0.0	6.7	5.0	0.0	11.7	0.0	5.0
July - September	158	24	0	0	20	4	0	12	0	0	15.2	0.0	0.0	12.7	2.5	0.0	7.6	0.0	0.0
July and September	94	22	0	0	18	4	0	12	0	0	23.4	0.0	0.0	19.1	4.3	0.0	12.8	0.0	0.0

Table A8-3. Numbers and frequencies of DELTs and other anomalies in freshwater drum captured in the Red and Assiniboine rivers, according to zone, February and March.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	3	1	0	0	0	1	0	0	0	0	33.3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0
Zone 2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 3	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	3	1	0	0	0	1	0	0	0	0	33.3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0

Table A8-4. Numbers and frequencies of DELTs and other anomalies in freshwater drum captured in the Red and Assiniboine rivers, according to zone, July.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	7	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	14.3	0.0	0.0
Zone 3	22	9	0	0	7	2	0	3	0	0	40.9	0.0	0.0	31.8	9.1	0.0	13.6	0.0	0.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	5	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0
Zone 5	10	8	0	0	8	0	0	0	0	0	80.0	0.0	0.0	80.0	0.0	0.0	0.0	0.0	0.0
Total	44	17	0	0	15	2	0	5	0	0	38.6	0.0	0.0	34.1	4.5	0.0	11.4	0.0	0.0

Table A8-5. Numbers and frequencies of DELTs and other anomalies in freshwater drum captured in the Red and Assiniboine rivers, according to zone, August.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	12	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 3	35	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	17	2	0	0	2	0	0	0	0	0	11.8	0.0	0.0	11.8	0.0	0.0	0.0	0.0	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	64	2	0	0	2	0	0	0	0	0	3.1	0.0	0.0	3.1	0.0	0.0	0.0	0.0	

Table A8-6. Numbers and frequencies of DELTs and other anomalies in freshwater drum captured in the Red and Assiniboine rivers, according to zone, September.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	6	2	0	0	2	0	0	2	0	0	33.3	0.0	0.0	33.3	0.0	0.0	33.3	0.0	0.0
Zone 3	18	2	0	0	1	1	0	3	0	0	11.1	0.0	0.0	5.6	5.6	0.0	16.7	0.0	0.0
Zone 3A	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4	25	1	0	0	0	1	0	2	0	0	4.0	0.0	0.0	0.0	4.0	0.0	8.0	0.0	0.0
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	50	5	0	0	3	2	0	7	0	0	10.0	0.0	0.0	6.0	4.0	0.0	14.0	0.0	0.0

Table A8-7. Numbers and frequencies of DELTs and other anomalies in freshwater drum captured in the Red and Assiniboine rivers, according to zone, October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	2	1	1	0	1	1	0	0	0	1	50.0	50.0	0.0	50.0	50.0	0.0	0.0	0.0	50.0
Zone 3	8	0	0	0	0	0	0	0	0	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	10	1	1	0	1	1	0	0	0	3	10.0	10.0	0.0	10.0	10.0	0.0	0.0	0.0	30.0

Table A8-8. Numbers and frequencies of DELTs and other anomalies in freshwater drum captured in the Red and Assiniboine rivers, according to zone, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	27	3	1	0	3	1	0	3	0	1	11.1	3.7	0.0	11.1	3.7	0.0	11.1	0.0	3.7
Zone 3	83	11	0	0	8	3	0	6	0	2	13.3	0.0	0.0	9.6	3.6	0.0	7.2	0.0	2.4
Zone 3A	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4	47	3	0	0	2	1	0	3	0	0	6.4	0.0	0.0	4.3	2.1	0.0	6.4	0.0	0.0
Zone 5	10	8	0	0	8	0	0	0	0	0	80.0	0.0	0.0	80.0	0.0	0.0	0.0	0.0	0.0
Total	168	25	1	0	21	5	0	12	0	3	14.9	0.6	0.0	12.5	3.0	0.0	7.1	0.0	1.8

Appendix 9. Number and frequencies of DELTs observed on golden redbhorse captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A9-1. Numbers and frequencies of DELTs and other anomalies in golden redhorse captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
Red River	Winter (February and March)	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	4	0	0	0	0	0	0	0	0	1
Assiniboine River		4	0	0	0	0	0	0	0	0	1
Red River	August	6	1	0	0	1	0	0	0	0	1
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	September	4	0	0	0	0	0	0	0	1	0
Assiniboine River		15	3	0	0	2	1	0	0	0	4
Red River	October	2	1	1	0	1	1	0	0	0	1
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	10	1	1	0	1	1	0	0	2	2
Assiniboine River		25	4	0	0	3	1	0	0	0	6
Red and Assiniboine rivers	July - October	35	5	1	0	4	2	0	0	2	8

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A9-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								Scale Disorientation
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	
Red River	Winter (February and March)	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0
Assiniboine River		4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0
Red River	August	6	16.7	0.0	0.0	16.7	0.0	0.0	0.0	0.0	16.7
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	September	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0
Assiniboine River		15	20.0	0.0	0.0	13.3	6.7	0.0	0.0	0.0	26.7
Red River	October	2	50.0	50.0	0.0	50.0	50.0	0.0	0.0	0.0	50.0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	10	10.0	10.0	0.0	10.0	10.0	0.0	0.0	20.0	20.0
Assiniboine River		25	16.0	0.0	0.0	12.0	4.0	0.0	0.0	0.0	24.0
Red and Assiniboine rivers	July - October	35	14.3	2.9	0.0	11.4	5.7	0.0	0.0	5.7	22.9

Table A9-2. Numbers and frequencies of DELTs and other anomalies in golden redhorse captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Winter (February and March)	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July	8	0	0	0	0	0	0	0	0	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0
August	6	1	0	0	1	0	0	0	0	1	16.7	0.0	0.0	16.7	0.0	0.0	0.0	0.0	16.7
September	19	3	0	0	2	1	0	0	1	3	15.8	0.0	0.0	10.5	5.3	0.0	0.0	5.3	15.8
October	2	1	1	0	1	1	0	0	0	1	50.0	50.0	0.0	50.0	50.0	0.0	0.0	0.0	50.0
July - October	35	5	1	0	4	2	0	0	1	7	14.3	2.9	0.0	11.4	5.7	0.0	0.0	2.9	20.0

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 3	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	6	1	0	0	1	0	0	0	0	1	16.7	0.0	0.0	16.7	0.0	0.0	0.0	0.0	16.7
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	6	1	0	0	1	0	0	0	0	1	16.7	0.0	0.0	16.7	0.0	0.0	0.0	0.0	16.7

Table A9-5. Numbers and frequencies of DELTs and other anomalies in golden redhorse captured in the Red and Assiniboine rivers, according to zone, September.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 2	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3A	1	0	0	0	0	0	0	0	1	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Zone 4	14	3	0	0	2	1	0	0	0	3	21.4	0.0	0.0	14.3	7.1	0.0	0.0	0.0	21.4
Zone 5	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	19	3	0	0	2	1	0	0	1	3	15.8	0.0	0.0	10.5	5.3	0.0	0.0	5.3	15.8

Table A9-6. Numbers and frequencies of DELTs and other anomalies in golden redhorse captured in the Red and Assiniboine rivers, according to zone, October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 3	2	1	1	0	1	1	0	0	0	1	50.0	50.0	0.0	50.0	50.0	0.0	0.0	0.0	
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	2	1	1	0	1	1	0	0	0	1	50.0	50.0	0.0	50.0	50.0	0.0	0.0	0.0	

Table A9-7. Numbers and frequencies of DELTs and other anomalies in golden redhorse captured in the Red and Assiniboine rivers, according to zone, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	5	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 3	4	1	1	0	1	1	0	0	1	2	25.0	25.0	0.0	25.0	25.0	0.0	0.0	25.0	
Zone 3A	1	0	0	0	0	0	0	0	1	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	
Zone 4	23	4	0	0	3	1	0	0	0	6	17.4	0.0	0.0	13.0	4.3	0.0	0.0	0.0	
Zone 5	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total	35	5	1	0	4	2	0	0	2	8	14.3	2.9	0.0	11.4	5.7	0.0	0.0	5.7	

Appendix 10. Number and frequencies of DELTs observed on goldeye captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A10-1. Numbers and frequencies of DELTs and other anomalies in goldeye captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River	Winter (February and March)	26	3	0	0	2	1	0	0	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	33	0	0	0	0	0	0	0	1	0
Assiniboine River		8	2	0	1	0	1	0	0	0	0
Red River	August	0	-	-	-	-	-	-	-	-	-
Assiniboine River		2	0	0	0	0	0	0	0	1	0
Red River	September	97	1	0	0	0	1	0	0	2	1
Assiniboine River		7	0	0	0	0	0	0	0	0	0
Red River	October	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	130	1	0	0	0	1	0	0	3	1
Assiniboine River		17	2	0	1	0	1	0	0	0	0
Red and Assiniboine rivers	July - October	147	3	0	1	0	2	0	0	3	1

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A10-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
Red River Assiniboine River	Winter (February and March)	26 0	11.5 -	0.0 -	0.0 -	7.7 -	3.8 -	0.0 -	0.0 -	0.0 -	0.0 -
Red River Assiniboine River	July	33 8	0.0 25.0	0.0 0.0	0.0 12.5	0.0 0.0	0.0 12.5	0.0 0.0	0.0 0.0	3.0 0.0	0.0 0.0
Red River Assiniboine River	August	0 2	- 0.0	- 0.0	- 0.0	- 0.0	- 0.0	- 0.0	- 0.0	- 50.0	- 0.0
Red River Assiniboine River	September	97 7	1.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	1.0 0.0	0.0 0.0	0.0 0.0	2.1 0.0	1.0 0.0
Red River Assiniboine River	October	0 0	- -	- -	- -	- -	- -	- -	- -	- -	- -
Red River Assiniboine River	July - October	130 17	0.8 11.8	0.0 0.0	0.0 5.9	0.0 0.0	0.8 5.9	0.0 0.0	0.0 0.0	2.3 0.0	0.8 0.0
Red and Assiniboine rivers	July - October	147	2.0	0.0	0.7	0.0	1.4	0.0	0.0	2.0	0.7

Table A10-2. Numbers and frequencies of DELTs and other anomalies in goldeye captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Winter (February and March)	26	3	0	0	2	1	0	0	0	0	11.5	0.0	0.0	7.7	3.8	0.0	0.0
July	41	2	0	1	0	1	0	0	1	0	4.9	0.0	2.4	0.0	2.4	0.0	0.0	2.4	0.0
August	2	0	0	0	0	0	0	0	1	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0
September	104	1	0	0	0	1	0	0	2	1	1.0	0.0	0.0	0.0	1.0	0.0	0.0	1.9	1.0
October	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July - October	147	3	0	1	0	2	0	0	4	1	2.0	0.0	0.7	0.0	1.4	0.0	0.0	2.7	0.7
September and October	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July - September	190	4	0	2	0	2	0	1	5	1	2.1	0.0	1.1	0.0	1.1	0.0	0.5	2.6	0.5
July and September	145	3	0	1	0	2	0	0	3	1	2.1	0.0	0.7	0.0	1.4	0.0	0.0	2.1	0.7

Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly										Frequency of DELT or other anomaly									
	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	
	Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	7	1	0	0	1	0	0	0	0	0	14.3	0.0	0.0	14.3	0.0	0.0	0.0	0.0	0.0	
Zone 2	13	2	0	0	1	1	0	0	0	0	15.4	0.0	0.0	7.7	7.7	0.0	0.0	0.0	0.0	
Zone 3	4	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 3A	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	26	3	0	0	2	1	0	0	0	0	11.5	0.0	0.0	7.7	3.8	0.0	0.0	0.0	0.0	

Table A10-4. Numbers and frequencies of DELTs and other anomalies in goldeye captured in the Red and Assiniboine rivers, according to zone, July.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	11	1	0	1	0	0	0	0	0	0	9.1	0.0	9.1	0.0	0.0	0.0	0.0
Zone 1	4	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	21	0	0	0	0	0	0	0	1	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	0.0
Zone 3	8	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	7	2	0	1	0	1	0	0	0	0	28.6	0.0	14.3	0.0	14.3	0.0	0.0	0.0	0.0
Zone 5	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	52	3	0	2	0	1	0	0	1	0	5.8	0.0	3.8	0.0	1.9	0.0	0.0	1.9	0.0

Table A10-5. Numbers and frequencies of DELTs and other anomalies in goldeye captured in the Red and Assiniboine rivers, according to zone, August.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 3	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	2	0	0	0	0	0	0	0	1	0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	2	0	0	0	0	0	0	0	1	0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	

Table A10-6. Numbers and frequencies of DELTs and other anomalies in goldeye captured in the Red and Assiniboine rivers, according to zone, September.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	32	0	0	0	0	0	0	1	1	0	0.0	0.0	0.0	0.0	0.0	0.0	3.1
Zone 1	14	0	0	0	0	0	0	0	0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1
Zone 2	18	1	0	0	0	1	0	0	2	0	5.6	0.0	0.0	0.0	5.6	0.0	0.0	11.1	0.0
Zone 3	39	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3A	26	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4	5	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 5	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	136	1	0	0	0	1	0	1	3	1	0.7	0.0	0.0	0.0	0.7	0.0	0.7	2.2	0.7

Table A10-7. Numbers and frequencies of DELTs and other anomalies in goldeye captured in the Red and Assiniboine rivers, according to zone, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	43	1	0	1	0	0	0	1	1	0	2.3	0.0	2.3	0.0	0.0	0.0	2.3
Zone 1	18	0	0	0	0	0	0	0	0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6
Zone 2	39	1	0	0	0	1	0	0	3	0	2.6	0.0	0.0	0.0	2.6	0.0	0.0	7.7	0.0
Zone 3	47	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3A	26	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4	14	2	0	1	0	1	0	0	1	0	14.3	0.0	7.1	0.0	7.1	0.0	0.0	7.1	0.0
Zone 5	3	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	190	4	0	2	0	2	0	1	5	1	2.1	0.0	1.1	0.0	1.1	0.0	0.5	2.6	0.5

Appendix 11. Number and frequencies of DELTs observed on lake cisco captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A11-1. Numbers and frequencies of DELTs and other anomalies in lake cisco captured in the Red and Assiniboine rivers, according to zone, February and March.

Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale disorientation
	Zone 1A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 3A	19	4	0	0	4	0	0	0	0	21.1	0.0	0.0	21.1	0.0	0.0	0.0	0.0	0.0
Zone 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	19	4	0	0	4	0	0	0	0	21.1	0.0	0.0	21.1	0.0	0.0	0.0	0.0	0.0

Appendix 12. Number and frequencies of DELTs observed on mooneye captured in the Red and Assiniboine rivers, according to month, river and zone.

Appendix 13. Number and frequencies of DELTs observed on northern pike captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A13-1. Numbers and frequencies of DELTs and other anomalies in northern pike captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
Red River	Winter (February and March)	20	2	0	1	0	1	0	0	0	2
Assiniboine River		0	0	0	0	0	0	0	0	0	0
Red River	July	9	0	0	0	0	0	0	0	0	0
Assiniboine River		3	0	0	0	0	0	0	0	0	0
Red River	August	7	0	0	0	0	0	0	0	0	0
Assiniboine River		0	0	0	0	0	0	0	0	0	0
Red River	September	1	0	0	0	0	0	0	0	0	0
Assiniboine River		0	0	0	0	0	0	0	0	0	0
Red River	October	1	0	0	0	0	0	0	1	0	0
Assiniboine River		0	0	0	0	0	0	0	0	0	0
Red River	July - October	18	0	0	0	0	0	0	1	0	0
Assiniboine River		3	0	0	0	0	0	0	0	0	0
Red and Assiniboine rivers	July - October	21	0	0	0	0	0	0	1	0	0

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A13-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River Assiniboine River	Winter (February and March)	20	10.0	0.0	5.0	0.0	5.0	0.0	0.0	0.0	10.0
		0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red River Assiniboine River	July	9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red River Assiniboine River	August	7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red River Assiniboine River	September	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red River Assiniboine River	October	1	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
		0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red River Assiniboine River	July - October	18	0.0	0.0	0.0	0.0	0.0	0.0	5.6	0.0	0.0
		3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red and Assiniboine rivers	July - October	21	0.0	0.0	0.0	0.0	0.0	0.0	4.8	0.0	0.0

Table A13-2. Numbers and frequencies of DELTs and other anomalies in northern pike captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Winter (February and March)	20	2	0	1	0	1	0	0	0	2	10.0	0.0	5.0	0.0	5.0	0.0	0.0	0.0	10.0
July	12	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
August	7	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
September	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
October	1	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
July - October	21	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	0.0	0.0

Table A13-3. Numbers and frequencies of DELTs and other anomalies in northern pike captured in the Red and Assiniboine rivers, according to zone, February and March.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	3	1	0	0	0	1	0	0	0	0	33.3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0
Zone 2	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	12	1	0	1	0	0	0	0	0	0	8.3	0.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3A	4	0	0	0	0	0	0	0	0	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	20	2	0	1	0	1	0	0	0	2	10.0	0.0	5.0	0.0	5.0	0.0	0.0	0.0	10.0

Table A13-7. Numbers and frequencies of DELTs and other anomalies in northern pike captured in the Red and Assiniboine rivers, according to zone, October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 3	1	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0

Table A13-8. Numbers and frequencies of DELTs and other anomalies in northern pike captured in the Red and Assiniboine rivers, according to zone, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 2	5	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	13	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	0.0	0.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 5	3	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	21	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	0.0	0.0

Appendix 14. Number and frequencies of DELTs observed on quillback captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A14-1. Numbers and frequencies of DELTs and other anomalies in quillback captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River	Winter (February and March)	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	20	8	0	0	5	3	0	0	2	0
Assiniboine River		7	5	1	1	4	0	1	0	1	2
Red River	August	83	10	0	0	8	2	0	0	3	22
Assiniboine River		7	1	0	0	1	0	0	0	0	1
Red River	September	13	2	0	0	2	0	0	1	0	2
Assiniboine River		4	0	0	0	0	0	0	0	0	0
Red River	October	52	24	3	2	19	4	2	0	8	19
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	168	44	3	2	34	9	2	1	13	43
Assiniboine River		18	6	1	1	5	0	1	0	1	3
Red and Assiniboine rivers	July - October	186	50	4	3	39	9	3	1	14	46

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A14-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River	Winter (February and March)	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	20	40.0	0.0	0.0	25.0	15.0	0.0	0.0	10.0	0.0
Assiniboine River		7	71.4	14.3	14.3	57.1	0.0	14.3	0.0	14.3	28.6
Red River	August	83	12.0	0.0	0.0	9.6	2.4	0.0	0.0	3.6	26.5
Assiniboine River		7	14.3	0.0	0.0	14.3	0.0	0.0	0.0	0.0	14.3
Red River	September	13	15.4	0.0	0.0	15.4	0.0	0.0	1.7	0.0	15.4
Assiniboine River		4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red River	October	52	46.2	5.8	3.8	36.5	7.7	3.8	0.0	15.4	36.5
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	168	26.2	1.8	1.2	20.2	5.4	1.2	0.6	7.7	25.6
Assiniboine River		18	33.3	5.6	5.6	27.8	0.0	5.6	0.0	5.6	16.7
Red and Assiniboine rivers	July - October	186	26.9	2.2	1.6	21.0	4.8	1.6	0.5	7.5	24.7

Table A14-2. Numbers and frequencies of DELTs and other anomalies in quillback captured in the Red and Assiniboine rivers, according to season of capture. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Winter (February and March)	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July	27	13	1	1	9	3	1	0	3	2	48.1	3.7	3.7	33.3	11.1	3.7	0.0	11.1	7.4
August	90	11	0	0	9	2	0	0	3	23	12.2	0.0	0.0	10.0	2.2	0.0	0.0	36.3	25.6
September	17	2	0	0	2	0	0	1	0	2	11.8	0.0	0.0	11.8	0.0	0.0	5.9	0.0	11.8
October	52	24	3	2	19	4	2	0	8	19	46.2	5.8	3.8	36.5	7.7	3.8	0.0	15.4	36.5
July - October	186	50	4	3	39	9	3	1	9	46	26.9	2.2	1.6	21.0	4.8	1.6	0.5	4.8	24.7

Table A14-3. Numbers and frequencies of DELTs and other anomalies in quillback captured in the Red and Assiniboine rivers, according to zone, July.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 2	10	3	0	0	1	2	0	0	0	0	30.0	0.0	0.0	10.0	20.0	0.0	0.0	0.0	
Zone 3	9	5	0	0	4	1	0	0	2	0	55.6	0.0	0.0	44.4	11.1	0.0	0.0	22.2	
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	7	5	1	1	4	0	1	0	1	2	71.4	14.3	14.3	57.1	0.0	14.3	0.0	14.3	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	27	13	1	1	9	3	1	0	3	2	48.1	3.7	3.7	33.3	11.1	3.7	0.0	11.1	

Table A14-4. Numbers and frequencies of DELTs and other anomalies in quillback captured in the Red and Assinboine rivers, according to zone, August.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	30	9	0	0	7	2	0	0	2	4	30.0	0.0	0.0	23.3	3.3	0.0	0.0	6.7	13.3
Zone 3	53	1	0	0	1	0	0	0	1	18	1.9	0.0	0.0	1.9	0.0	0.0	0.0	1.9	34.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	7	1	0	0	1	0	0	0	0	1	14.3	0.0	0.0	14.3	0.0	0.0	0.0	0.0	14.3
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	90	11	0	0	9	2	0	0	3	23	12.2	0.0	0.0	10.0	2.2	0.0	0.0	3.3	25.6

Table A14-5. Numbers and frequencies of DELTs and other anomalies in quillback captured in the Red and Assiniboine rivers, according to zone, September.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	7	1	0	0	1	0	0	1	0	2	14.3	0.0	0.0	14.3	0.0	0.0	14.3	0.0	28.6
Zone 3	6	1	0	0	1	0	0	0	0	0	16.7	0.0	0.0	16.7	0.0	0.0	0.0	0.0	0.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	4	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	17	2	0	0	2	0	0	1	0	2	11.8	0.0	0.0	11.8	0.0	0.0	5.9	0.0	11.8

Table A14-6. Numbers and frequencies of DELTs and other anomalies in quillback captured in the Red and Assiniboine rivers, according to zone, October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 3	52	24	3	3	19	4	2	0	8	19	46.2	5.8	3.8	36.5	7.7	3.8	0.0	15.4	36.5
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	52	24	3	3	19	4	2	0	8	19	46.2	5.8	5.8	36.5	7.7	3.8	0.0	15.4	36.5

Table A14-7. Numbers and frequencies of DELTs and other anomalies in quillback captured in the Red and Assiniboine rivers, according to zone, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One		Multiple		External		Scale			One		Multiple		External		Scale		
		DELT	DELTs	Deformities	Erosion	Lesions	Tumours	Parasites	Hemmorhaging	Disorientation	DELT	DELTs	Deformities	Erosion	Lesions	Tumours	Parasites	Hemmorhaging	Disorientation
Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	47	13	0	0	9	4	0	1	2	6	27.7	0.0	0.0	19.1	8.5	0.0	2.1	4.3	12.8
Zone 3	120	31	3	2	25	5	2	0	11	37	25.8	2.5	1.7	20.8	4.2	1.7	0.0	9.2	30.8
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	18	6	1	1	5	0	1	0	1	3	33.3	5.6	5.6	27.8	0.0	5.6	0.0	5.6	16.7
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	186	50	4	3	39	9	3	1	14	46	26.9	2.2	1.6	21.0	4.8	1.6	0.5	7.5	24.7

Appendix 15. Number and frequencies of DELTs observed on rock bass captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A15-1. Numbers and frequencies of DELTs and other anomalies in rock bass captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River	Winter (February and March)	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	2	1	0	0	0	1	0	0	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	August	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	September	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	October	1	1	0	0	0	1	0	0	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	3	1	0	0	0	1	0	0	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red and Assiniboine rivers	July - October	3	1	0	0	0	1	0	0	0	0

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A15-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
Red River	Winter (February and March)	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	2	50.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	August	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	September	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	October	1	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	3	33.3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red and Assiniboine rivers	July - October	3	33.3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0

Table A15-2. Numbers and frequencies of DELTs and other anomalies in rock bass captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Winter (February and March)	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July	2	1	0	0	0	1	0	0	0	0	50.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0
August	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
September	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
July - October	3	1	0	0	0	1	0	0	0	0	33.3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0

Table A15-3. Numbers and frequencies of DELTs and other anomalies in rock bass captured in the Red and Assiniboine rivers, according to zone, July.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One		Multiple		External			Scale		One		Multiple		External			Scale	
		DELT	DELTs	Deformities	Erosion	Lesions	Tumours	Parasites	Hemmorhaging	disorientation	DELT	DELTs	Deformities	Erosion	Lesions	Tumours	Parasites	Hemmorhaging	disorientation
Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 2	1	1	0	0	0	1	0	0	0	0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Zone 3	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	2	1	0	0	0	1	0	0	0	0	50.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0

Note: all captured in July

Table A15-5. Numbers and frequencies of DELTs and other anomalies in rock bass captured in the Red and Assiniboine rivers, according to zone, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 2	1	1	0	0	0	1	0	0	0	0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Zone 3	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	3	1	0	0	0	1	0	0	0	0	33.3	0.0	0.0	0.0	33.3	0.0	0.0	0.0	0.0

Appendix 16. Number and frequencies of DELTs observed on sauger captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A16-1. Numbers and frequencies of DELTs and other anomalies in sauger captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River	Winter (February and March)	21	0	0	0	0	0	0	0	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	28	0	0	0	0	0	0	1	0	0
Assiniboine River		16	1	0	0	1	0	0	0	0	0
Red River	August	169	8	1	0	7	2	0	0	0	0
Assiniboine River		7	0	0	0	0	0	0	0	0	0
Red River	September	187	5	1	1	3	1	1	12	0	0
Assiniboine River		58	1	0	0	1	0	0	1	0	0
Red River	October	93	3	0	1	1	1	0	7	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	477	16	2	2	11	4	1	20	0	0
Assiniboine River		81	2	0	0	2	0	0	1	0	0
Red and Assiniboine rivers	July - October	558	18	2	2	13	4	1	21	0	0

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A16-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
Red River Assiniboine River	Winter (February and March)	21 0	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -
Red River Assiniboine River	July	28 16	0.0 6.3	0.0 0.0	0.0 0.0	0.0 6.3	0.0 0.0	0.0 0.0	3.6 0.0	0.0 0.0	0.0 0.0
Red River Assiniboine River	August	169 7	4.7 0.0	0.6 0.0	0.0 0.0	4.1 0.0	1.2 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0
Red River Assiniboine River	September	187 58	2.7 1.7	0.5 0.0	0.5 0.0	1.6 1.7	0.5 0.0	0.5 0.0	6.4 1.7	0.0 0.0	0.0 0.0
Red River Assiniboine River	October	93 0	3.2 -	0.0 -	1.1 -	1.1 -	1.1 -	0.0 -	7.5 -	0.0 -	0.0 -
Red River Assiniboine River	July - October	477 81	3.4 2.5	0.4 0.0	0.4 0.0	2.3 2.5	0.8 0.0	0.2 0.0	4.2 1.2	0.0 0.0	0.0 0.0
Red and Assiniboine rivers	July - October	558	3.2	0.4	0.4	2.3	0.7	0.2	3.8	0.0	0.0

Table A16-2. Numbers and frequencies of DELTs and other anomalies in sauger captured in the Red and Assiniboine rivers according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Winter (February and March)	21	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
July	44	1	0	0	1	0	0	1	0	0	2.2	0.0	0.0	2.2	0.0	0.0	2.2	0.0	0.0
August	176	8	1	0	7	2	0	0	0	0	4.5	0.6	0.0	4.0	1.1	0.0	0.0	0.0	0.0
September	245	6	1	1	4	1	1	13	0	0	2.4	0.4	0.4	1.6	0.4	0.4	5.3	0.0	0.0
October	93	3	0	1	1	1	0	7	0	0	3.2	0.0	1.1	1.1	1.1	0.0	7.5	0.0	0.0
July - October	558	18	2	2	13	4	1	21	0	0	3.2	0.4	0.4	2.3	0.7	0.2	3.8	0.0	0.0

Table A16-4. Numbers and frequencies of DELTs and other anomalies in sauger captured in the Red and Assiniboine rivers, according to zones, July.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 1	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	5	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	16	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	0.0
Zone 3A	6	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4	13	1	0	0	1	0	0	0	0	0	7.7	0.0	0.0	7.7	0.0	0.0	0.0	0.0	0.0
Zone 5	3	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	46	1	0	0	1	0	0	1	0	0	2.2	0.0	0.0	2.2	0.0	0.0	2.2	0.0	0.0

Table A16-5. Numbers and frequencies of DELTs and other anomalies in sauger captured in the Red and Assiniboine rivers, according to zones, August.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	67	8	1	0	7	2	0	0	0	0	11.9	1.5	0.0	10.4	3.0	0.0	0.0	0.0	
Zone 3	102	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 3A	7	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	176	8	1	0	7	2	0	0	0	0	4.5	0.6	0.0	4.0	1.1	0.0	0.0	0.0	

Table A16-6. Numbers and frequencies of DELTs and other anomalies in sauger captured in the Red and Assiniboine rivers, according to zones, September.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	15	3	0	0	3	0	0	2	0	0	20.0	0.0	0.0	20.0	0.0	0.0	13.3	0.0	0.0
Zone 2	29	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0
Zone 3	27	1	1	1	0	0	1	4	0	0	3.7	3.7	3.7	0.0	0.0	3.7	14.8	0.0	0.0
Zone 3A	116	1	0	0	0	1	0	5	0	0	0.9	0.0	0.0	0.0	0.9	0.0	4.3	0.0	0.0
Zone 4	56	1	0	0	1	0	0	1	0	0	1.8	0.0	0.0	1.8	0.0	0.0	1.8	0.0	0.0
Zone 5	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	245	6	1	1	4	1	1	13	0	0	2.4	0.4	0.4	1.6	0.4	0.4	5.3	0.0	0.0

Table A16-7. Numbers and frequencies of DELTs and other anomalies in sauger captured in the Red and Assiniboine rivers, according to zones, October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	68	1	0	0	1	0	0	5	0	0	1.5	0.0	0.0	1.5	0.0	0.0	7.4	0.0	0.0
Zone 3	25	2	0	1	0	1	0	2	0	0	8.0	0.0	4.0	0.0	4.0	0.0	8.0	0.0	0.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	93	3	0	1	1	1	0	7	0	0	3.2	0.0	1.1	1.1	1.1	0.0	7.5	0.0	0.0

Table A16-8. Numbers and frequencies of DELTs and other anomalies in sauger captured in the Red and Assiniboine rivers, according to zones, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumour s	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumour s	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 1	16	3	0	0	3	0	0	2	0	0	18.8	0.0	0.0	18.8	0.0	0.0	12.5	0.0	0.0
Zone 2	169	9	1	0	8	2	0	6	0	0	5.3	0.6	0.0	4.7	1.2	0.0	3.6	0.0	0.0
Zone 3	170	3	1	2	0	1	1	7	0	0	1.8	0.6	1.2	0.0	0.6	0.6	4.1	0.0	0.0
Zone 3A	122	1	0	0	0	1	0	5	0	0	0.8	0.0	0.0	0.0	0.8	0.0	4.1	0.0	0.0
Zone 4	76	2	0	0	2	0	0	1	0	0	2.6	0.0	0.0	2.6	0.0	0.0	1.3	0.0	0.0
Zone 5	5	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	560	18	2	2	13	4	1	21	0	0	3.2	0.4	0.4	2.3	0.7	0.2	3.8	0.0	0.0

Appendix 17. Number and frequencies of DELTs observed on shorthead redhorse captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A17-1. Numbers and frequencies of DELTs and other anomalies in shorthead redhorse captured in the Red and Assiniboine rivers, by month of capture

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River	Winter (February and March)	2	0	0	0	0	0	0	0	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	23	7	0	0	1	6	0	2	0	2
Assiniboine River		73	20	0	2	3	14	1	5	1	19
Red River	August	19	0	0	0	0	0	0	0	0	6
Assiniboine River		21	0	0	0	0	0	0	0	0	5
Red River	September	45	3	0	0	2	0	1	2	0	7
Assiniboine River		175	14	1	3	2	8	2	8	0	71
Red River	October	4	0	0	0	0	0	0	0	1	2
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	91	10	0	0	3	6	1	4	0	17
Assiniboine River		269	34	1	5	5	22	3	13	1	95
Red and Assiniboine rivers	July - October	360	44	1	5	8	28	4	17	1	112

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A17-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								
			One DELT	Multiple DELTS	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
Red River Assiniboine River	Winter (February and March)	2 0	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -
Red River Assiniboine River	July	23 73	30.4 27.4	0.0 0.0	0.0 2.7	4.3 4.1	26.1 19.2	0.0 1.4	8.7 6.8	0.0 1.4	8.7 26.0
Red River Assiniboine River	August	19 21	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	0.0 0.0	31.6 23.8
Red River Assiniboine River	September	45 175	6.7 8.0	0.0 0.6	0.0 1.7	4.4 1.1	0.0 4.6	2.2 1.1	4.4 4.6	0.0 0.0	15.6 40.6
Red River Assiniboine River	October	4 0	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	0.0 -	25.0 -	50.0 -
Red River Assiniboine River	July - October	91 269	11.0 12.6	0.0 0.4	0.0 1.9	3.3 1.9	6.6 8.2	1.1 1.1	4.4 4.8	0.0 0.4	18.7 35.3
Red and Assiniboine rivers	July - October	360	12.2	0.3	1.4	2.2	7.8	1.1	4.7	0.3	31.1

Table A17-2. Numbers and frequencies of DELTs and other anomalies in shorthead redhorse captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Winter (February and March)	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
July	96	27	0	2	4	20	1	7	1	21	28.1	0.0	2.1	4.2	20.8	1.0	7.3	1.0	21.9
August	40	0	0	0	0	0	0	0	0	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.5
September	220	17	1	3	4	8	3	10	0	78	7.7	0.5	1.4	1.8	3.6	1.4	4.5	0.0	35.5
October	4	0	0	0	0	0	0	0	1	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	50.0
July - October	360	44	1	5	8	28	4	17	1	112	12.2	0.3	1.4	2.2	7.8	1.1	4.7	0.3	31.1

Table A17-4. Numbers and frequencies of DELTs and other anomalies in shorthead redhorse captured in the Red and Assiniboine rivers, according to zone, July.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
Zone 1A	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 1	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	8	3	0	0	0	3	0	1	0	0	37.5	0.0	0.0	0.0	37.5	0.0	12.5	0.0	0.0
Zone 3	13	4	0	0	1	3	0	1	0	2	30.8	0.0	0.0	7.7	23.1	0.0	7.7	0.0	15.4
Zone 3A	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4	61	16	0	1	1	13	1	4	1	16	26.2	0.0	1.6	1.6	21.3	1.6	6.6	1.6	26.2
Zone 5	12	4	0	1	2	1	0	1	0	3	33.3	0.0	8.3	16.7	8.3	0.0	8.3	0.0	25.0
Total	97	27	0	2	4	20	1	7	1	21	27.8	0.0	2.1	4.1	20.6	1.0	7.2	1.0	21.6

Table A17-6. Numbers and frequencies of DELTs and other anomalies in shorthead redhorse captured in the Red and Assiniboine rivers, according to zone, September.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 1	2	1	0	0	1	0	0	0	0	1	50.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	50.0
Zone 2	25	2	0	0	1	0	1	1	0	4	8.0	0.0	0.0	4.0	0.0	4.0	4.0	0.0	16.0
Zone 3	16	0	0	0	0	0	0	1	0	2	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	12.5
Zone 3A	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4	166	13	1	3	2	7	2	6	0	69	7.8	0.6	1.8	1.2	4.2	1.2	3.6	0.0	41.6
Zone 5	9	1	0	0	0	1	0	2	0	2	11.1	0.0	0.0	0.0	11.1	0.0	22.2	0.0	22.2
Total	221	17	1	3	4	8	3	10	0	78	7.7	0.5	1.4	1.8	3.6	1.4	4.5	0.0	35.3

Table A17-7. Numbers and frequencies of DELTs and other anomalies in shorthead redhorse captured in the Red and Assiniboine rivers, according to zone, October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 3	4	0	0	0	0	0	0	0	1	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	50.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	4	0	0	0	0	0	0	0	1	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	50.0

Table A17-8. Numbers and frequencies of DELTs and other anomalies in shorthead redhorse captured in the Red and Assiniboine rivers, according to zone, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 1	3	1	0	0	1	0	0	0	0	1	33.3	0.0	0.0	33.3	0.0	0.0	0.0	0.0	33.3
Zone 2	41	5	0	0	1	3	1	2	0	6	12.2	0.0	0.0	2.4	7.3	2.4	4.9	0.0	14.6
Zone 3	44	4	0	0	1	3	0	2	0	10	9.1	0.0	0.0	2.3	6.8	0.0	4.5	0.0	22.7
Zone 3A	3	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4	248	29	1	4	3	20	3	10	1	90	11.7	0.4	1.6	1.2	8.1	1.2	4.0	0.4	36.3
Zone 5	21	5	0	1	2	2	0	3	0	5	23.8	0.0	4.8	9.5	9.5	0.0	14.3	0.0	23.8
Total	362	44	1	5	8	28	4	17	1	112	12.2	0.3	1.4	2.2	7.7	1.1	4.7	0.3	30.9

Appendix 18. Number and frequencies of DELTs observed on silver redhorse captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A18-1. Numbers and frequencies of DELTs and other anomalies in silver redhorse captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River Assiniboine River	Winter (February and March)	0	-	-	-	-	-	-	-	-	-
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	July	8	1	0	0	0	1	0	0	0	0
		10	4	0	1	2	0	1	1	0	4
Red River Assiniboine River	August	0	-	-	-	-	-	-	-	-	-
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	September	2	0	0	0	0	0	0	0	0	0
		1	0	0	0	0	0	0	0	0	0
Red River Assiniboine River	October	2	1	0	0	1	0	0	0	0	1
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	July - October	12	2	0	0	1	1	0	0	0	1
		11	4	0	1	2	0	1	1	0	4
Red and Assiniboine rivers	July - October	23	6	0	1	3	1	1	1	0	5

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A18-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River Assiniboine River	Winter (February and March)	0	-	-	-	-	-	-	-	-	-
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	July	8	12.5	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0
		10	40.0	0.0	10.0	20.0	0.0	10.0	10.0	0.0	40.0
Red River Assiniboine River	August	0	-	-	-	-	-	-	-	-	-
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	September	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red River Assiniboine River	October	2	50.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	50.0
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	July - October	12	16.7	0.0	0.0	8.3	8.3	0.0	0.0	0.0	8.3
		11	36.4	0.0	9.1	18.2	0.0	9.1	9.1	0.0	36.4
Red and Assiniboine rivers	July - October	23	26.1	0.0	4.3	13.0	4.3	4.3	4.3	0.0	21.7

Table A18-2. Numbers and frequencies of DELTs and other anomalies in silver redhorse captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Winter (February and March)	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
July	18	5	0	1	2	1	1	1	0	4	27.8	0.0	5.6	11.1	5.6	5.6	5.6	0.0	22.2
August	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
September	3	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
October	2	1	0	0	1	0	0	0	0	1	50.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	50.0
July - October	23	6	0	1	3	1	1	2	0	5	26.1	0.0	4.3	13.0	4.3	4.3	8.7	0.0	21.7

Table A18-3. Numbers and frequencies of DELTs and other anomalies in silver redhorse captured in the Red and Assiniboine rivers, according to zone, July.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 2	4	1	0	0	0	1	0	0	0	0	25.0	0.0	0.0	0.0	25.0	0.0	0.0	0.0	
Zone 3	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 3A	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 4	9	3	0	1	1	0	1	1	0	4	33.3	0.0	11.1	11.1	0.0	11.1	11.1	0.0	
Zone 5	1	1	0	0	1	0	0	0	0	0	100.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	
Total	18	5	0	1	2	1	1	1	0	4	27.8	0.0	5.6	11.1	5.6	5.6	5.6	0.0	

Table A18-4. Numbers and frequencies of DELTs and other anomalies in silver redhorse captured in the Red and Assiniboine rivers, according to zone, September.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	1	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 2	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	4	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	0.0	0.0

Table A18-5. Numbers and frequencies of DELTs and other anomalies in silver redhorse captured in the Red and Assiniboine rivers, according to zone, October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 3	2	1	0	0	1	0	0	0	0	1	50.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	50.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	2	1	0	0	1	0	0	0	0	1	50.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	50.0

Table A18-6. Numbers and frequencies of DELTs and other anomalies in silver redhorse captured in the Red and Assiniboine rivers, according to zone, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	1	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Zone 1	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	5	1	0	0	0	1	0	0	0	0	20.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0
Zone 3	4	1	0	0	1	0	0	0	0	1	25.0	0.0	0.0	25.0	0.0	0.0	0.0	0.0	25.0
Zone 3A	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4	10	3	0	1	1	0	1	1	0	4	30.0	0.0	10.0	10.0	0.0	10.0	10.0	0.0	40.0
Zone 5	1	1	0	0	1	0	0	0	0	0	100.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Total	24	6	0	1	3	1	1	2	0	5	25.0	0.0	4.2	12.5	4.2	4.2	8.3	0.0	20.8

Appendix 19. Number and frequencies of DELTs observed on stonecat captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A19-1. Numbers and frequencies of DELTs and other anomalies in stonecat captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River	Winter (February and March)	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July	2	0	0	0	0	0	0	0	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	August	0	-	-	-	-	-	-	-	-	-
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	September	1	0	0	0	0	0	0	0	0	0
Assiniboine River		1	0	0	0	0	0	0	0	0	0
Red River	October	1	0	0	0	0	0	0	0	0	0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	4	0	0	0	0	0	0	0	0	0
Assiniboine River		1	0	0	0	0	0	0	0	0	0
Red and Assiniboine rivers	July - October	5	0	0	0	0	0	0	0	0	0

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Appendix 20. Number and frequencies of DELTs observed on walleye captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A20-1. Numbers and frequencies of DELTs and other anomalies in walleye captured in the Red and Assiniboine rivers, by month of capture.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River	Winter (February and March)	6	1	0	0	0	0	1	0	0	0
Assiniboine River		1	0	0	0	0	0	0	0	0	0
Red River	July	10	1	0	0	0	1	0	1	1	0
Assiniboine River		5	1	0	0	1	0	0	0	0	1
Red River	August	13	1	0	0	1	0	0	0	0	0
Assiniboine River		1	0	0	0	0	0	0	0	0	0
Red River	September	10	0	0	0	0	0	0	0	0	0
Assiniboine River		4	0	0	0	0	0	0	0	0	0
Red River	October	1	0	0	0	0	0	0	0	0	0
Assiniboine River		0	0	0	0	0	0	0	0	0	0
Red River	July - October	34	2	0	0	1	1	0	1	1	0
Assiniboine River		10	1	0	0	1	0	0	0	0	1
Red and Assiniboine rivers	July - October	44	3	0	0	2	1	0	1	1	1

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A20-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								Scale Disorientation
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	
Red River	Winter (February and March)	6	16.7	0.0	0.0	0.0	0.0	16.7	0.0	0.0	0.0
Assiniboine River		1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red River	July	10	9.1	0.0	0.0	0.0	9.1	0.0	9.1	10.0	0.0
Assiniboine River		5	20.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	20.0
Red River	August	13	7.7	0.0	0.0	7.7	0.0	0.0	0.0	0.0	0.0
Assiniboine River		1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red River	September	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Assiniboine River		4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red River	October	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Assiniboine River		0	-	-	-	-	-	-	-	-	-
Red River	July - October	34	5.9	0.0	0.0	2.9	2.9	0.0	2.9	2.9	0.0
Assiniboine River		10	10.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0
Red and Assiniboine rivers	July - October	44	6.8	0.0	0.0	4.5	2.3	0.0	2.3	2.3	2.3

Table A20-2. Numbers and frequencies of DELTs and other anomalies in walleye captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Winter (February and March)	7	1	0	0	0	0	1	0	0	0	14.3	0.0	0.0	0.0	0.0	14.3	0.0
July	15	2	0	0	1	1	0	1	1	1	13.3	0.0	0.0	6.7	6.7	0.0	6.7	6.7	6.7
August	14	1	0	0	1	0	0	0	0	0	7.1	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.0
September	14	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
October	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
July - October	44	3	0	0	2	1	0	1	1	1	6.8	0.0	0.0	4.5	2.3	0.0	2.3	2.3	2.3

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	1	1	0	0	0	0	1	0	0	0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Zone 2	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 3	5	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 5	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total	7	1	0	0	0	0	1	0	0	0	14.3	0.0	0.0	0.0	0.0	14.3	0.0	0.0	0.0

Table 20-4. Numbers and frequencies of DELTs and other anomalies in walleye captured in the Red and Assiniboine rivers, according to zone, July.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 1	3	0	0	0	0	0	0	0	1	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0
Zone 2	3	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	4	1	0	0	0	1	0	1	0	0	25.0	0.0	0.0	0.0	25.0	0.0	25.0	0.0	0.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	4	0	0	0	0	0	0	0	0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0
Zone 5	1	1	0	0	1	0	0	0	0	0	100.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Total	16	2	0	0	1	1	0	1	1	1	12.5	0.0	0.0	6.3	6.3	0.0	6.3	6.3	6.3

Table A20-5. Numbers and frequencies of DELTs and other anomalies in walleye captured in the Red and Assiniboine rivers, according to zone, August.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	12	1	0	0	1	0	0	0	0	0	8.3	0.0	0.0	8.3	0.0	0.0	0.0	0.0	
Zone 3	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	14	1	0	0	1	0	0	0	0	0	7.1	0.0	0.0	7.1	0.0	0.0	0.0	0.0	

Table A20-8. Numbers and frequencies of DELTs and other anomalies in walleye captured in the Red and Assiniboine rivers, according to zone, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 1	3	0	0	0	0	0	0	0	1	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0
Zone 2	20	1	0	0	1	0	0	0	0	0	5.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0
Zone 3	8	1	0	0	0	1	0	1	0	0	12.5	0.0	0.0	0.0	12.5	0.0	12.5	0.0	0.0
Zone 3A	3	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 4	8	0	0	0	0	0	0	0	0	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5
Zone 5	2	1	0	0	1	0	0	0	0	0	50.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0
Total	45	3	0	0	2	1	0	1	1	1	6.7	0.0	0.0	4.4	2.2	0.0	2.2	2.2	2.2

Appendix 21. Number and frequencies of DELTs observed on white sucker captured in the Red and Assiniboine rivers, according to month, river and zone.

River ¹	Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River Assiniboine River	Winter (February and March)	31	5	0	2	1	2	0	0	0	2
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	July	62	11	2	2	3	8	0	10	6	1
		18	4	1	2	2	1	0	2	6	2
Red River Assiniboine River	August	36	3	0	0	2	0	1	0	0	0
		4	0	0	0	0	0	0	0	0	0
Red River Assiniboine River	September	77	20	4	0	10	11	3	10	10	8
		22	2	0	1	0	1	0	8	1	3
Red River Assiniboine River	October	28	5	1	0	1	3	2	3	3	3
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	July - October	203	39	7	2	16	22	6	23	19	12
		44	6	1	3	2	2	0	10	7	5
Red and Assiniboine rivers	July - October	247	45	8	5	18	24	6	33	26	17

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A21-1. - continued -

River ¹	Season	Total Number of Fish Captured (n)	Frequency of DELT or other anomaly								
			One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
Red River Assiniboine River	Winter (February and March)	31	16.1	0.0	6.5	3.2	6.5	0.0	0.0	0.0	6.5
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	July	62	17.7	3.2	3.2	4.8	12.9	0.0	16.1	9.7	1.6
		18	22.2	5.6	11.1	11.1	5.6	0.0	11.1	33.3	11.1
Red River Assiniboine River	August	36	8.3	0.0	0.0	5.6	0.0	2.8	0.0	0.0	0.0
		4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red River Assiniboine River	September	77	26.0	5.2	0.0	13.0	14.3	3.9	13.0	13.0	10.4
		22	9.1	0.0	4.5	0.0	4.5	0.0	36.4	4.5	13.6
Red River Assiniboine River	October	28	17.9	3.6	0.0	3.6	10.7	7.1	10.7	10.7	10.7
		0	-	-	-	-	-	-	-	-	-
Red River Assiniboine River	July - October	203	19.2	3.4	1.0	7.9	10.8	3.0	11.3	9.4	5.9
		44	13.6	2.3	6.8	4.5	4.5	0.0	22.7	15.9	11.4
Red and Assiniboine rivers	July - October	247	18.2	3.2	2.0	7.3	9.7	2.4	13.4	10.5	6.9

Table A21-2. Numbers and frequencies of DELTs and other anomalies in white sucker captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Winter (February and March)	31	5	0	2	1	2	0	0	0	2	16.1	0.0	6.5	3.2	6.5	0.0	0.0
July	80	15	3	4	5	9	0	12	12	3	18.8	3.8	5.0	6.3	11.3	0.0	15.0	15.0	3.8
August	40	3	0	0	2	0	1	0	0	0	7.5	0.0	0.0	5.0	0.0	2.5	0.0	0.0	0.0
September	99	22	4	1	10	12	3	18	11	11	22.2	4.0	1.0	10.1	12.1	3.0	18.2	11.1	11.1
October	28	5	1	0	1	3	2	3	3	3	17.9	3.6	0.0	3.6	10.7	7.1	10.7	10.7	10.7
July - October	247	45	8	5	18	24	6	33	26	17	18.2	3.2	2.0	7.3	9.7	2.4	13.4	10.5	6.9

Table A21-3. Numbers and frequencies of DELTs and other anomalies in white sucker captured in the Red and Assiniboine rivers, according to zone, February and March.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	4	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 2	1	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3	2	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Zone 3A	24	5	0	2	1	2	0	0	0	2	20.8	0.0	8.3	4.2	8.3	0.0	0.0	0.0	8.3
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	31	5	0	2	1	2	0	0	0	2	16.1	0.0	6.5	3.2	6.5	0.0	0.0	0.0	6.5

Table A21-4. Numbers and frequencies of DELTs and other anomalies in white sucker captured in the Red and Assiniboine rivers, according to zone, July.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	1	1	1	0	1	1	0	0	0	0	100.0	100.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0
Zone 2	15	1	0	0	0	1	0	3	0	0	6.7	0.0	0.0	0.0	6.7	0.0	20.0	0.0	0.0
Zone 3	46	9	1	2	2	6	0	7	6	1	19.6	2.2	4.3	4.3	13.0	0.0	15.2	13.0	2.2
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 4	15	3	1	2	1	1	0	2	5	2	20.0	6.7	13.3	6.7	6.7	0.0	13.3	33.3	13.3
Zone 5	3	1	0	0	1	0	0	0	1	0	33.3	0.0	0.0	33.3	0.0	0.0	0.0	33.3	0.0
Total	80	15	3	4	5	9	0	12	12	3	18.8	3.8	5.0	6.3	11.3	0.0	15.0	15.0	3.8

Table A21-5. Numbers and frequencies of DELTs and other anomalies in white sucker captured in the Red and Assiniboine rivers, according to zone, August.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	5	2	0	0	2	0	0	0	0	0	40.0	0.0	0.0	40.0	0.0	0.0	0.0	0.0	
Zone 3	31	1	0	0	0	0	1	0	0	0	3.2	0.0	0.0	0.0	0.0	3.2	0.0	0.0	
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	4	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	40	3	0	0	2	0	1	0	0	0	7.5	0.0	0.0	5.0	0.0	2.5	0.0	0.0	

Table A21-6. Numbers and frequencies of DELTs and other anomalies in white sucker captured in the Red and Assiniboine rivers, according to zone, September.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	4	2	1	0	2	1	0	0	0	0	50.0	25.0	0.0	50.0	25.0	0.0	0.0	0.0	0.0
Zone 2	34	6	1	0	1	4	2	1	1	4	17.6	2.9	0.0	2.9	11.8	5.9	2.9	2.9	11.8
Zone 3	36	12	2	0	7	6	1	8	9	4	33.3	5.6	0.0	19.4	16.7	2.8	22.2	25.0	11.1
Zone 3A	3	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0
Zone 4	22	2	0	1	0	1	0	8	1	3	9.1	0.0	4.5	0.0	4.5	0.0	36.4	4.5	13.6
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	99	22	4	1	10	12	3	18	11	11	22.2	4.0	1.0	10.1	12.1	3.0	18.2	11.1	11.1

Table A21-7. Numbers and frequencies of DELTs and other anomalies in white sucker captured in the Red and Assiniboine rivers, according to zone, October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemorrhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 2	8	1	1	0	1	1	0	0	0	2	12.5	12.5	0.0	12.5	12.5	0.0	0.0	0.0	25.0
Zone 3	20	4	0	0	0	2	2	3	3	1	20.0	0.0	0.0	0.0	10.0	10.0	15.0	15.0	5.0
Zone 3A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 4	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Zone 5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total	28	5	1	0	1	3	2	3	3	3	17.9	3.6	0.0	3.6	10.7	7.1	10.7	10.7	10.7

Table A21-8. Numbers and frequencies of DELTs and other anomalies in white sucker captured in the Red and Assiniboine rivers, according to zone, July through October.

	Total Number of Fish Captured (n)	Number of fish with DELT or other anomaly									Frequency of DELT or other anomaly								
		One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation	One DELT	Multiple DELTs	Deformities	Erosion	Lesions	Tumours	External Parasites	Hemmorhaging	Scale Disorientation
		Zone 1A	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zone 1	5	3	2	0	3	2	0	0	0	0	60.0	40.0	0.0	60.0	40.0	0.0	0.0	0.0	0.0
Zone 2	62	10	2	0	4	6	2	4	1	6	16.1	3.2	0.0	6.5	9.7	3.2	6.5	1.6	9.7
Zone 3	133	26	3	2	9	14	4	18	18	6	19.5	2.3	1.5	6.8	10.5	3.0	13.5	13.5	4.5
Zone 3A	3	0	0	0	0	0	0	1	0	0	0.0	0.0	0.0	0.0	0.0	0.0	33.3	0.0	0.0
Zone 4	41	5	1	3	1	2	0	10	6	5	12.2	2.4	7.3	2.4	4.9	0.0	24.4	14.6	12.2
Zone 5	3	1	0	0	1	0	0	0	1	0	33.3	0.0	0.0	33.3	0.0	0.0	0.0	33.3	0.0
Total	247	45	8	5	18	24	6	33	26	17	18.2	3.2	2.0	7.3	9.7	2.4	13.4	10.5	6.9

Appendix 22. Fork lengths, wet weights, and condition factors of bigmouth buffalo captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A22-1. Summary statistics for fork length, wet weight, and condition factor of bigmouth buffalo captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		345	-	-	1	825	-	-	1	2.01	-	-	1
Red River	August	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		417	-	-	1	1600	-	-	1	2.21	-	-	1
Red River	September	511	18	498-524	2	2900	495	2550-3250	2	2.16	0.14	2.06-2.26	2
Assiniboine River		633	-	-	1	5500	-	-	1	2.17	-	-	1
Red River	October	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	511	18	498-524	2	2900	495	2550-3250	2	2.16	0.14	2.06-2.26	2
Assiniboine River		465	150	345-633	3	2642	2506	825-5500	3	2.13	0.10	2.01-2.21	3

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A22-2.

Summary statistics for fork length, wet weight, and condition factor of bigmouth buffalo captured in the Red and Assiniboine rivers, according to month. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
July	345	-	-	1	825	-	-	1	2.01	-	-	1
August	417	-	-	1	1600	-	-	1	2.21	-	-	1
September	552	72	498-633	3	3767	1541	2550-5500	3	2.16	0.10	2.06-2.26	3
October	-	-	-	-	-	-	-	-	-	-	-	-
July - October	483	109	345-633	5	2745	1794	825-5500	5	2.14	0.10	2.01-2.26	5

Appendix 23. Fork lengths, wet weights, and condition factors of black bullhead captured in the Red and Assiniboine rivers, according to month, river and zone.

Appendix 24. Fork lengths, wet weights, and condition factors of black crappie captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A24-1. Summary statistics for fork length, wet weight, and condition factor of black crappie captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		240	-	-	1	200	-	-	1	1.45	-	-	1
Red River	August	228	-	-	1	200	-	-	1	1.69	-	-	1
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	September	203	-	-	1	150	-	-	1	1.79	-	-	1
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	October	146	-	-	1	75	-	-	1	2.41	-	-	1
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	192	42	146-228	3	142	63	75-200	3	1.96	0.39	1.69-2.41	3
Assiniboine River		240	-	-	1	200	-	-	1	1.45	-	-	1

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A24-2.

Summary statistics for fork length, wet weight, and condition factor of black crappie captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
July	240	-	-	1	200	-	-	1	1.45	-	-	1
August	228	-	-	1	200	-	-	1	1.69	-	-	1
September	203	-	-	1	150	-	-	1	1.79	-	-	1
October	146	-	-	1	75	-	-	1	2.41	-	-	1
July - October	204	42	146-240	4	156	59	75-200	4	1.83	0.41	1.45-2.41	4

Appendix 25. Fork lengths, wet weights, and condition factors of brown bullhead captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A25-1. Summary statistics for fork length, wet weight, and condition factor of brown bullhead captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	255	-	-	1	300	-	-	1	1.81	-	-	1
Assiniboine River		171	-	-	1	-	-	-	-	-	-	-	-
Red River	August	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	September	190	15	169-202	4	108	14	100-125	3	1.70	0.44	1.21-2.07	3
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	October	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	203	32	169-255	5	156	97	100-300	4	1.73	0.36	1.21-2.07	4
Assiniboine River		171	-	-	1	-	-	-	-	-	-	-	-

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A25-2.

Summary statistics for fork length, wet weight, and condition factor of brown bullhead captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
July	213	59	171-255	2	300	-	-	1	1.81	-	-	1
August	-	-	-	-	-	-	-	-	-	-	-	-
September	190	15	169-202	4	108	14	100-125	3	1.70	0.44	1.21-2.07	3
October	-	-	-	-	-	-	-	-	-	-	-	-
July - October	180	15	169-190	2	113	18	100-125	2	1.95	0.18	1.82-2.07	2

Appendix 26. Fork lengths, wet weights, and condition factors of burbot captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A26-1.

Summary statistics for fork length, wet weight, and condition factor of burbot captured in the Red and Assiniboine rivers, according to season. All fish captured in the Red River. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	290	-	-	1	150	-	-	1	0.62	-	-	1
July	287	45	205-362	14	191	65	75-275	14	0.80	0.18	0.58-1.16	14
August	-	-	-	-	-	-	-	-	-	-	-	-
September	386	95	257-525	6	475	209	250-800	5	0.66	0.11	0.55-0.79	5
October	413	106	320-560	4	519	407	225-1100	4	0.64	0.07	0.55-0.69	4
July - October	333	88	205-560	24	310	237	75-1100	23	0.74	0.16	0.55-1.16	23

Appendix 27. Fork lengths, wet weights, and condition factors of carp captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A27-1. Summary statistics for fork length, wet weight, and condition factor of carp captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	530	68	478-650	5	3815	2651	2225-8500	5	2.3	0.50	1.85-3.10	5
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	486	113	195-711	35	2442	1669	200-9250	35	1.89	0.29	1.52-2.70	35
Assiniboine River		563	90	290-752	34	3201	1284	450-7775	34	1.73	0.34	1.01-2.90	34
Red River	August	564	50	488-658	11	3273	1075	2100-5400	11	1.78	0.23	1.39-2.13	11
Assiniboine River		597	21	582-612	2	4100	566	3700-4500	2	1.92	0.06	1.88-1.96	2
Red River	September	502	93	226-628	19	2606	1075	225-4400	19	1.92	0.17	1.60-2.21	19
Assiniboine River		556	80	361-660	30	3536	1279	900-5300	29	1.98	0.15	1.57-2.18	29
Red River	October	573	66	517-679	5	3580	1038	2650-5300	5	1.88	0.14	1.69-2.08	5
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	509	101	195-711	70	2698	1432	200-9250	70	1.88	0.25	1.39-2.70	70
Assiniboine River		561	84	290-752	66	3378	1271	450-7775	65	1.85	0.29	1.01-2.90	65

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A27-2.

Summary statistics for fork length, wet weight, and condition factor of carp captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	530	68	478-650	5	3815	2651	2225-8500	5	2.30	0.50	1.85-3.10	5
July	524	109	195-752	69	2816	1529	200-9250	69	1.81	0.32	1.01-2.90	69
August	569	48	488-658	13	3400	1042	2100-5400	13	1.80	0.21	1.39-2.13	13
September	535	89	226-660	49	3168	1276	225-5300	48	1.95	0.16	1.57-2.21	48
October	573	66	517-679	5	3580	1038	2650-5300	5	1.88	0.14	1.69-2.08	5
July - October	534	97	195-752	136	3026	1394	200-9250	135	1.86	0.27	1.01-2.90	135

Table A27-3. Summary statistics for fork length, wet weight, and condition factor of carp captured in the Red and Assiniboine rivers, according to zone, July.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-
2	480	77	310-541	8	2081	741	700-3125	8	1.84	0.27	1.52-2.35	8
3	468	115	195-711	24	2103	1175	200-5550	24	1.88	0.28	1.54-2.70	24
3A	644	60	590-708	3	6117	2725	4300-9250	3	2.19	0.37	1.88-2.61	3
4	571	78	290-752	33	3280	1217	450-7775	33	1.72	0.33	1.01-2.90	33
5	295	-	-	1	600	-	-	1	2.34	-	-	1

Table A27-5. Summary statistics for fork length, wet weight, and condition factor of carp captured in the Red and Assiniboine rivers, according to zone, September.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	478	-	-	1	2325	-	-	1	2.13	-	-	1
1	-	-	-	-	-	-	-	-	-	-	-	-
2	417	136	226-515	4	1706	1161	225-2750	4	1.93	0.07	1.86-2.01	4
3	524	67	388-628	15	2846	951	1290-4400	15	1.92	0.19	1.60-2.21	15
3A	-	-	-	-	-	-	-	-	-	-	-	-
4	556	82	361-660	29	3573	1287	900-5300	28	1.99	0.12	1.71-2.18	28
5	542	-	-	1	2500	-	-	1	1.57	-	-	1

Table A27-6. Summary statistics for fork length, wet weight, and condition factor of carp captured in the Red and Assiniboine rivers, according to zone, October.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	478	-	-	1	2325	-	-	1	2.13	-	-	1
1	-	-	-	-	-	-	-	-	-	-	-	-
2	443	131	226-548	5	1985	1183	225-3100	5	1.92	0.06	1.86-2.01	5
3	536	71	388-679	19	3026	1027	1290-5300	19	1.91	0.18	1.60-2.21	19
3A	-	-	-	-	-	-	-	-	-	-	-	-
4	556	82	361-660	29	3573	1287	900-5300	28	1.99	0.12	1.71-2.18	28
5	542	-	-	1	2500	-	-	1	1.57	-	-	0

Table A27-7. Summary statistics for fork length, wet weight, and condition factor of carp captured in the Red and Assiniboine rivers, according to zone, July through October.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	478	-	-	1	2325	-	-	1	2.13	-	-	1
1	-	-	-	-	-	-	-	-	-	-	-	-
2	475	100	226-600	14	2113	891	225-3125	14	1.83	0.24	1.39-2.35	14
3	510	98	195-711	53	2660	1211	200-5550	53	1.88	0.23	1.51-2.70	53
3A	644	60	590-708	3	6117	2725	4300-9250	3	2.19	0.37	1.88-2.61	3
4	565	78	290-752	64	3437	1235	450-7775	63	1.84	0.29	1.01-2.90	63
5	419	175	295-542	2	1550	1344	600-2500	2	1.95	0.54	1.57-2.34	2

Appendix 28. Fork lengths, wet weights, and condition factors of channel catfish captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A28-1. Summary statistics for fork length, wet weight, and condition factor of channel catfish captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	453	323	213-820	3	3817	6222	100-11000	3	1.34	0.56	1.00-2.00	3
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	393	169	180-710	29	1368	1496	75-5100	28	1.31	0.17	0.98-1.73	28
Assiniboine River		485	160	237-780	10	2005	1744	200-5700	10	1.35	0.20	0.97-1.69	10
Red River	August	538	132	205-820	293	2750	1853	200-8800	290	1.49	0.17	1.03-2.45	290
Assiniboine River		595	142	192-748	35	3449	1971	125-6900	35	1.39	0.18	0.95-1.78	35
Red River	September	382	135	123-690	134	1177	1305	50-6350	131	1.41	0.20	0.91-2.13	131
Assiniboine River		585	126	231-783	48	3219	1711	200-7200	45	1.42	0.18	1.03-1.95	45
Red River	October	325	89	182-597	253	567	568	75-3100	253	1.31	0.18	0.89-2.06	253
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	427	154	123-820	709	1615	1703	50-8800	702	1.40	0.20	0.89-2.45	702
Assiniboine River		578	139	192-783	93	3173	1850	125-7200	90	1.40	0.18	0.95-1.95	90

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A28-2.

Summary statistics for fork length, wet weight, and condition factor of channel catfish captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	453	323	213-820	3	3817	6222	100-11000	3	1.34	0.56	1.00-2.00	3
July	417	170	180-780	39	1536	1567	75-5700	38	1.32	0.17	0.97-1.73	38
August	544	134	192-820	328	2825	1876	125-8800	325	1.48	0.17	0.95-2.45	325
September	436	160	123-783	182	1699	1673	50-7200	176	1.41	0.20	0.91-2.13	176
October	325	89	182-597	253	567	568	75-3100	253	1.31	0.18	0.89-2.06	253
July - October	444	160	123-820	802	1792	1789	50-8800	792	1.40	0.20	0.89-2.45	792

Table 28-4. Summary statistics for fork length, wet weight, and condition factor of channel catfish captured in the Red and Assiniboine rivers, according to zone, July.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	476	331	242-710	2	2630	3493	160-5100	2	1.28	0.21	1.13-1.42	2
2	382	160	180-680	22	1198	1290	75-4250	21	1.30	0.14	0.98-1.66	21
3	408	187	182-616	5	1580	1651	75-3500	5	1.39	0.27	1.02-1.73	5
3A	-	-	-	-	-	-	-	-	-	-	-	-
4	452	130	237-618	9	1594	1235	200-3550	9	1.37	0.20	0.97-1.69	9
5	780	-	-	1	5700	-	-	1	1.20	-	-	1

Table 28-6. Summary statistics for fork length, wet weight, and condition factor of channel catfish captured in the Red and Assiniboine rivers, according to zone, September.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	496	174	188-680	12	2738	2356	100-6350	12	1.55	0.27	1.20-2.04	12
2	369	139	123-690	78	1075	1130	50-4950	75	1.37	0.21	0.91-2.13	75
3	374	100	237-652	44	924	877	250-3900	44	1.45	0.15	1.11-1.88	44
3A	-	-	-	-	-	-	-	-	-	-	-	-
4	574	147	231-783	32	3148	1940	200-7200	29	1.41	0.17	1.17-1.77	29
5	606	67	478-670	16	3347	1240	1300-5300	16	1.42	0.21	1.03-1.95	16

Table 28-8. Summary statistics for fork length, wet weight, and condition factor of channel catfish captured in the Red and Assiniboine rivers, according to zone, July through October.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	493	185	188-710	14	2722	2374	100-6350	14	1.52	0.27	1.13-2.04	14
2	346	122	123-788	358	816	1085	50-7675	354	1.32	0.19	0.89-2.13	354
3	510	137	182-820	337	2415	1808	75-8800	334	1.48	0.17	1.00-2.45	334
3A	-	-	-	-	-	-	-	-	-	-	-	-
4	569	148	192-783	76	3101	1952	125-7200	73	1.40	0.18	0.95-1.78	73
5	617	77	478-780	17	3485	1330	1300-5700	17	1.41	0.21	1.03-1.95	17

Appendix 29. Fork lengths, wet weights, and condition factors of freshwater drum captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A29-1. Summary statistics for fork length, wet weight, and condition factor of freshwater drum captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	361	26	340-390	3	683	166	575-875	3	1.43	0.07	1.35-1.48	3
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	402	78	196-554	29	983	544	100-2500	29	1.37	0.14	1.00-1.73	29
Assiniboine River		404	81	260-545	15	930	527	275-1925	15	1.29	0.12	1.13-1.56	15
Red River	August	359	68	237-480	47	729	455	200-1600	47	1.45	0.19	1.00-1.86	47
Assiniboine River		394	78	309-603	17	940	789	375-3500	17	1.31	0.16	1.05-1.65	17
Red River	September	370	55	270-503	25	780	411	275-2000	25	1.43	0.16	1.09-1.72	25
Assiniboine River		390	57	287-512	25	861	417	300-1900	25	1.35	0.20	0.98-1.82	25
Red River	October	360	50	265-425	10	613	240	200-1100	10	1.26	0.17	0.99-1.46	10
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	373	68	196-585	111	796	467	100-2500	111	1.41	0.18	0.99-1.86	111
Assiniboine River		395	69	260-603	57	903	569	275-3500	57	1.32	0.17	0.98-1.82	57

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A29-2.

Summary statistics for fork length, wet weight, and condition factor of freshwater drum captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	361	26	340-390	3	683	166	575-875	3	1.43	0.07	1.35-1.48	3
July	403	78	196-554	44	965	533	100-2500	44	1.34	0.13	1.00-1.73	44
August	368	72	237-603	64	785	564	200-3500	64	1.41	0.19	1.00-1.86	64
September	380	56	270-512	50	821	412	275-2000	50	1.39	0.18	0.98-1.82	50
October	360	50	265-425	10	613	240	200-1100	10	1.26	0.17	0.99-1.46	10
July - October	380	69	196-603	168	832	505	100-3500	168	1.38	0.18	0.98-1.86	168

Table A29-4.

Summary statistics for fork length, wet weight, and condition factor of freshwater drum captured in the Red and Assiniboine rivers, according to zone, July.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-
2	420	79	320-554	7	1143	698	425-2500	7	1.39	0.09	1.30-1.52	7
3	397	79	196-526	22	932	495	100-2050	22	1.36	0.15	1.00-1.73	22
3A	-	-	-	-	-	-	-	-	-	-	-	-
4	384	92	260-505	5	830	530	275-1675	5	1.34	0.15	1.17-1.56	5
5	414	78	313-545	10	980	547	375-1925	10	1.26	0.10	1.13-1.40	10

Table A29-8. Summary statistics for fork length, wet weight, and condition factor of freshwater drum captured in the Red and Assiniboine rivers, according to zone, July through October.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-
2	391	64	292-554	27	889	511	400-2500	27	1.38	0.18	1.00-1.79	27
3	366	69	196-585	83	759	449	100-2500	83	1.41	0.18	0.99-1.86	83
3A	445	-	-	1	1350	-	-	1	1.53	-	-	1
4	391	67	260-603	47	886	577	275-3500	47	1.34	0.18	0.98-1.82	47
5	414	78	313-545	10	980	547	375-1925	10	1.26	0.10	1.13-1.40	10

Appendix 30. Fork lengths, wet weights, and condition factors of golden redbhorse captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A30-1. Summary statistics for fork length, wet weight, and condition factor of golden redhorse captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	354	63	262-396	4	625	294	225-900	4	1.31	0.11	1.25-1.47	4
Assiniboine River		415	96	305-520	4	1244	795	450-2200	4	1.55	0.05	1.48-1.59	4
Red River	August	398	107	236-502	6	1390	607	450-2000	5	1.64	0.10	1.56-1.79	5
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	September	434	154	205-542	4	1785	1157	190-2950	4	1.84	0.27	1.58-2.21	4
Assiniboine River		394	92	174-504	15	1216	576	450-2000	14	1.63	0.13	1.41-1.85	14
Red River	October	468	18	455-480	2	1500	71	1450-1550	2	1.47	0.10	1.40-1.54	2
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	409	108	205-542	10	1264	889	190-2950	10	1.55	0.31	1.25-2.21	10
Assiniboine River		398	92	174-520	25	1259	595	450-2200	23	1.62	0.11	1.41-1.85	23

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A30-2.

Summary statistics for fork length, wet weight, and condition factor of golden redhorse captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
July	384	82	262-520	8	934	646	225-2200	8	1.43	0.15	1.25-1.59	8
August	398	107	236-502	6	1390	607	450-2000	5	1.64	0.10	1.56-1.79	5
September	403	104	174-542	19	1343	741	190-2950	18	1.68	0.18	1.41-2.21	18
October	468	18	455-480	2	1500	71	1450-1550	2	1.47	0.10	1.40-1.54	2
July - October	401	95	174-542	35	1260	683	190-2950	33	1.60	0.19	1.25-2.21	33

Table A30-3. Summary statistics for fork length, wet weight, and condition factor of golden redhorse captured in the Red and Assiniboine rivers, according to zone, July.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-
2	340	70	262-396	3	533	281	225-775	3	1.25	0.00	1.25	3
3	394	-	-	1	900	-	-	1	1.47	-	-	1
3A	-	-	-	-	-	-	-	-	-	-	-	-
4	430	112	305-520	3	1408	887	450-2200	3	1.58	0.01	1.56-1.59	3
5	370	-	-	1	750	-	-	1	1.48	-	-	1

Table A30-7. Summary statistics for fork length, wet weight, and condition factor of golden redhorse captured in the Red and Assiniboine rivers, according to zone, July through October.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-
2	402	98	262-494	5	1120	831	225-2100	5	1.41	0.23	1.25-1.74	5
3	384	124	205-480	4	1023	624	190-1550	4	1.65	0.37	1.40-2.21	4
3A	542	-	-	1	2950	-	-	1	1.85	-	-	1
4	409	83	236-520	23	1282	599	450-2200	22	1.62	0.11	1.41-1.85	22
5	272	139	174-370	2	750	-	-	1	1.48	-	-	1

Appendix 31. Fork lengths, wet weights, and condition factors of goldeye captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A31-1. Summary statistics for fork length, wet weight, and condition factor of goldeye captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	247	44	145-306	26	205	81	50-350	24	1.16	0.21	0.68-1.51	24
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	193	38	145-278	33	88	92	25-400	31	0.96	0.36	0.48-1.94	31
Assiniboine River		225	65	159-317	8	169	143	50-450	8	1.24	0.35	0.89-2.00	8
Red River	August	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		240	76	186-294	2	200	141	100-300	2	1.37	0.26	1.18-1.55	2
Red River	September	199	66	96-314	97	195	83	50-425	65	1.34	0.22	0.89-2.02	65
Assiniboine River		248	39	197-308	7	204	73	100-325	7	1.30	0.18	1.11-1.64	7
Red River	October	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	198	60	96-314	131	160	99	25-425	97	1.21	0.33	0.48-2.02	97
Assiniboine River		236	54	159-317	17	187	112	50-450	17	1.28	0.27	0.89-2.00	17

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A31-2.

Summary statistics for fork length, wet weight, and condition factor of goldeye captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	247	44	145-306	26	205	81	50-350	24	1.16	0.21	0.68-1.51	24
July	199	45	145-317	41	104	108	25-450	39	1.02	0.37	0.48-2.00	39
August	240	76	186-294	2	200	141	100-300	2	1.37	0.26	1.18-1.55	2
September	203	65	96-314	104	196	82	50-425	72	1.33	0.22	0.89-2.02	72
October	-	-	-	-	-	-	-	-	-	-	-	-
July - October	202	60	96-317	147	164	101	25-450	113	1.23	0.32	0.48-2.02	113

Table A31-4. Summary statistics for fork length, wet weight, and condition factor of goldeye captured in the Red and Assiniboine rivers, according to zone, July.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	230	60	164-316	11	145	126	30-400	11	0.93	0.22	0.53-1.27	11
1	173	6	166-179	4	50	0	-	4	0.98	0.10	0.87-1.09	4
2	198	40	160-278	21	60	113	25-400	20	0.93	0.42	0.48-1.94	20
3	189	42	145-270	8	75	29	50-125	7	1.05	0.30	0.51-1.50	7
3A	-	-	-	-	-	-	-	-	-	-	-	-
4	234	64	164-317	7	186	146	50-450	7	1.24	0.38	0.89-2.00	7
5	159	-	-	1	50	-	-	1	1.24	-	-	1

Table A31-6. Summary statistics for fork length, wet weight, and condition factor of goldeye captured in the Red and Assiniboine rivers, according to zone, September.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	167	59	102-316	32	112	88	50-375	19	1.11	0.22	0.79-1.61	19
1	238	28	176-295	14	160	58	50-290	14	1.13	0.13	0.89-1.36	14
2	218	75	107-309	18	237	105	90-400	13	1.27	0.16	1.05-1.61	13
3	194	64	96-314	39	190	89	75-425	26	1.44	0.23	1.00-2.02	26
3A	172	65	101-257	26	200	53	100-250	12	1.42	0.14	1.16-1.54	12
4	257	42	197-308	5	215	84	100-325	5	1.21	0.08	1.11-1.31	5
5	226	23	209-242	2	175	35	150-200	2	1.53	0.16	1.41-1.64	2

Table A31-7. Summary statistics for fork length, wet weight, and condition factor of goldeye captured in the Red and Assiniboine rivers, according to zone, July through October.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	183	65	102-316	43	124	103	30-400	30	1.05	0.24	0.53-1.61	30
1	224	37	166-295	18	136	69	50-290	18	1.10	0.13	0.87-1.36	18
2	207	59	107-309	39	154	127	25-400	33	1.07	0.38	0.48-1.94	33
3	193	61	96-314	47	165	93	50-425	33	1.36	0.29	0.51-2.02	33
3A	172	65	101-257	26	200	53	100-250	12	1.42	0.14	1.16-1.54	12
4	243	55	164-317	14	198	117	50-450	14	1.25	0.27	0.89-2.00	14
5	203	42	159-242	3	133	76	50-200	3	1.43	0.20	1.24-1.64	3

Appendix 32. Fork lengths, wet weights, and condition factors of lake cisco captured in the Red and Assiniboine rivers, according to month, river and zone.

Appendix 33. Fork lengths, wet weights, and condition factors of mooneye captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A33-1. Summary statistics for fork length, wet weight, and condition factor of mooneye captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	193	14	175-210	6	73	6	60-75	6	1.03	0.18	0.81-1.22	6
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	230	49	195-264	2	150	141	50-250	2	1.02	0.48	0.67-1.36	2
Assiniboine River		229	32	206-251	2	188	18	175-200	2	1.63	0.52	1.26-2.00	2
Red River	August	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	September	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	October	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Appendix 34. Fork lengths, wet weights, and condition factors of northern pike captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A34-1. Summary statistics for fork length, wet weight, and condition factor of northern pike captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	620	117	404-811	20	2199	1340	400-5150	20	0.79	0.14	0.41-0.98	20
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	381	144	243-710	9	508	714	100-2350	9	0.65	0.21	0.45-1.05	9
Assiniboine River		350	25	331-378	3	375	177	250-500	2	0.78	0.20	0.64-0.93	2
Red River	August	496	136	312-670	7	1100	823	250-2450	7	0.77	0.08	0.64-0.88	7
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	September	565	-	-	1	1250	-	-	1	0.69	-	-	1
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	October	565	-	-	1	1350	-	-	1	0.75	-	-	1
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	446	145	243-710	18	826	768	100-2450	18	0.70	0.16	0.45-1.05	18
Assiniboine River		350	25	331-378	3	375	177	250-500	2	0.78	0.20	0.64-0.93	2

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A34-2.

Summary statistics for fork length, wet weight, and condition factor of northern pike captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	620	117	404-811	20	2199	1340	400-5150	20	0.79	0.14	0.41-0.98	20
July	373	124	243-710	12	484	643	100-2350	11	0.67	0.21	0.45-1.05	11
August	496	136	312-670	7	1100	823	250-2450	7	0.77	0.08	0.64-0.88	7
September	565	-	-	1	1250	-	-	1	0.69	-	-	1
October	565	-	-	1	1350	-	-	1	0.75	-	-	1
July - October	432	139	243-710	21	781	741	100-2450	20	0.71	0.16	0.45-1.05	20

Table A34-4. Summary statistics for fork length, wet weight, and condition factor of northern pike captured in the Red and Assiniboine rivers, according to zone, July.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-
2	305	87	243-366	2	313	230	150-475	2	1.01	0.05	0.97-1.05	2
3	403	154	260-710	7	564	809	100-2350	7	0.55	0.07	0.45-0.66	7
3A	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-
5	350	25	331-378	3	375	177	250-500	2	0.78	0.20	0.64-0.93	2

Table A34-8. Summary statistics for fork length, wet weight, and condition factor of northern pike captured in the Red and Assiniboine rivers, according to zone, July through October.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-
2	430	178	243-670	5	885	950	150-2450	5	0.86	0.16	0.64-1.05	5
3	452	139	260-710	13	804	730	100-2350	13	0.64	0.13	0.45-0.88	13
3A	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-
5	350	25	331-378	3	375	177	250-500	2	0.78	0.20	0.64-0.93	2

Appendix 35. Fork lengths, wet weights, and condition factors of quillback captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A35-1. Summary statistics for fork length, wet weight, and condition factor of quillback captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	353	82	148-471	20	956	532	75-2000	20	1.92	0.28	0.95-2.31	20
Assiniboine River		368	68	260-435	7	1089	508	450-1875	7	2.09	0.28	1.69-2.56	7
Red River	August	386	44	243-480	83	1215	362	300-2100	83	2.07	0.22	1.67-2.80	83
Assiniboine River		389	26	355-420	7	1121	138	950-1300	7	1.91	0.19	1.75-2.25	7
Red River	September	394	76	156-455	13	1382	442	90-1850	13	2.13	0.21	1.81-2.64	13
Assiniboine River		387	44	349-448	4	1263	335	900-1700	4	2.17	0.22	1.89-2.40	4
Red River	October	419	26	352-480	52	1406	256	800-2100	52	1.91	0.24	1.39-2.53	52
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	393	53	148-480	168	1256	388	75-2100	168	2.00	0.24	0.95-2.80	168
Assiniboine River		380	48	260-448	18	1140	350	450-1875	18	2.04	0.25	1.69-2.56	18

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A35-2.

Summary statistics for fork length, wet weight, and condition factor of quillback captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
July	357	78	148-471	27	991	519	75-2000	27	1.97	0.29	0.95-2.56	27
August	386	43	243-480	90	1208	350	300-2100	90	2.05	0.22	1.67-2.80	90
September	392	69	156-455	17	1354	412	90-1850	17	2.14	0.21	1.81-2.64	17
October	419	26	352-480	52	1406	256	800-2100	52	1.91	0.24	1.39-2.53	52
July - October	391	52	148-480	186	1245	385	75-2100	186	2.01	0.24	0.95-2.80	186

Appendix 36. Fork lengths, wet weights, and condition factors of rock bass captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A36-1. Summary statistics for fork length, wet weight, and condition factor of rock bass captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	139	65	93-185	2	175	-	-	1	2.76	-	-	1
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	August	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	September	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	October	183	-	-	1	175	-	-	1	2.86	-	-	1
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	154	53	93-185	3	175	0	-	2	2.81	0.06	2.76-2.86	2
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Appendix 37. Fork lengths, wet weights, and condition factors of sauger captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A37-1. Summary statistics for fork length, wet weight, and condition factor of sauger captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	247	28	186-305	21	159	53	100-250	19	0.95	0.17	0.74-1.46	19
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	233	43	139-343	28	135	78	25-400	27	0.99	0.24	0.55-1.58	27
Assiniboine River		246	35	191-300	16	163	47	100-275	16	1.12	0.32	0.59-1.79	16
Red River	August	278	26	222-350	169	288	74	100-525	169	1.34	0.24	0.83-1.99	169
Assiniboine River		292	24	272-332	7	314	80	250-450	7	1.25	0.12	1.09-1.41	7
Red River	September	267	35	193-403	187	243	94	50-750	187	1.24	0.18	0.65-1.76	187
Assiniboine River		264	39	196-329	58	229	100	60-400	58	1.18	0.19	0.77-1.60	58
Red River	October	277	33	210-373	93	233	80	75-450	93	1.07	0.18	0.52-1.76	93
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	271	34	139-403	477	251	91	25-750	476	1.22	0.23	0.52-1.99	476
Assiniboine River		263	38	191-332	81	223	97	60-450	81	1.17	0.22	0.59-1.79	81

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A37-2.

Summary statistics for fork length, wet weight, and condition factor of sauger captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	247	28	186-305	21	159	53	100-250	19	0.95	0.17	0.74-1.46	19
July	238	40	139-343	44	145	69	25-400	43	1.04	0.27	0.55-1.79	43
August	279	26	222-350	176	289	74	100-525	176	1.33	0.23	0.83-1.99	176
September	266	36	193-403	245	240	96	50-750	245	1.22	0.18	0.65-1.76	245
October	277	33	210-373	93	233	80	75-450	93	1.07	0.18	0.52-1.76	93
July - October	270	35	139-403	558	247	93	25-750	557	1.22	0.23	0.52-1.99	557

Table A37-4. Summary statistics for fork length, wet weight, and condition factor of sauger captured in the Red and Assiniboine rivers, according to zone, July.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	238	23	222-254	2	125	35	100-150	2	0.91	0.00	0.91-0.92	2
1	279	-	-	1	200	-	-	1	0.92	-	-	1
2	235	29	208-273	5	113	52	50-175	4	0.75	0.14	0.55-0.86	4
3	234	53	139-343	16	144	95	25-400	16	1.03	0.26	0.55-1.58	16
3A	223	9	216-240	6	117	26	100-150	6	1.04	0.13	0.90-1.28	6
4	240	36	191-300	13	167	51	100-275	13	1.22	0.25	0.92-1.79	13
5	276	15	260-290	3	142	14	125-150	3	0.69	0.15	0.59-0.85	3

Table A37-6.

Summary statistics for fork length, wet weight, and condition factor of sauger captured in the Red and Assiniboine rivers, according to zone, September.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	275	31	237-335	15	226	69	150-375	15	1.07	0.12	0.87-1.26	15
2	266	35	193-308	29	228	81	50-400	29	1.16	0.19	0.65-1.60	29
3	265	36	210-334	27	226	102	75-475	27	1.17	0.26	0.77-1.76	27
3A	266	35	194-403	116	253	98	100-750	116	1.29	0.13	0.99-1.76	116
4	262	38	196-329	56	225	98	60-400	56	1.18	0.20	0.77-1.60	56
5	310	11	302-318	2	350	71	300-400	2	1.17	0.11	1.09-1.24	2

Table A37-8.

Summary statistics for fork length, wet weight, and condition factor of sauger captured in the Red and Assiniboine rivers, according to zone, July through October.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	238	23	222-254	2	125	35	100-150	2	0.91	0.00	0.91-0.92	2
1	275	30	237-335	16	224	67	150-375	16	1.06	0.12	0.87-1.26	16
2	276	31	193-373	169	239	74	50-450	168	1.10	0.18	0.52-1.81	168
3	269	35	139-350	170	268	99	25-525	170	1.32	0.27	0.55-1.99	170
3A	264	36	194-403	122	247	100	100-750	122	1.28	0.14	0.90-1.76	122
4	261	39	191-332	76	223	97	60-450	76	1.19	0.20	0.77-1.79	76
5	289	22	260-318	5	225	120	125-400	5	0.88	0.29	0.59-1.24	5

Appendix 38. Fork lengths, wet weights, and condition factors of shorthead redhorse captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A38-1. Summary statistics for fork length, wet weight, and condition factor of shorthead redhorse captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	300	170	180-420	2	688	866	75-1300	2	1.52	0.33	1.29-1.75	2
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	326	57	200-437	23	530	250	100-1050	23	1.41	0.11	1.24-1.61	23
Assiniboine River		350	41	155-485	73	604	187	75-1725	73	1.39	0.19	0.77-2.01	73
Red River	August	362	34	275-414	19	730	186	375-1100	19	1.52	0.18	1.09-1.80	19
Assiniboine River		355	32	273-403	21	652	145	350-850	21	1.45	0.19	1.06-1.76	21
Red River	September	353	47	217-436	45	698	233	250-1150	43	1.51	0.18	1.16-2.13	43
Assiniboine River		345	33	196-437	175	610	153	150-1250	171	1.46	0.15	1.20-1.99	171
Red River	October	374	33	340-415	4	788	225	600-1100	4	1.48	0.06	1.40-1.54	4
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	349	48	200-437	91	666	239	100-1150	89	1.48	0.17	1.09-2.13	89
Assiniboine River		347	35	155-485	269	612	162	75-1725	265	1.44	0.17	0.77-2.01	265

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A38-2.

Summary statistics for fork length, wet weight, and condition factor of shorthead redhorse captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	300	170	180-420	2	688	866	75-1300	2	1.52	0.33	1.29-1.75	2
July	344	46	155-485	96	587	205	75-1725	96	1.40	0.18	0.77-2.01	96
August	359	33	273-414	40	689	168	350-1100	40	1.48	0.19	1.06-1.80	40
September	347	36	196-437	220	626	177	150-1250	215	1.47	0.16	1.16-2.13	215
October	374	33	340-415	4	788	225	600-1100	4	1.48	0.06	1.40-1.54	4
July - October	348	39	155-485	360	625	186	75-1725	354	1.45	0.17	0.77-2.13	354

Table A38-4.

Summary statistics for fork length, wet weight, and condition factor of shorthead redhorse captured in the Red and Assiniboine rivers, according to zone, July.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	301	-	-	1	400	-	-	1	1.47	-	-	1
1	340	-	-	1	550	-	-	1	1.40	-	-	1
2	304	44	246-380	8	419	185	200-750	8	1.41	0.10	1.32-1.61	8
3	334	63	200-437	13	569	270	100-1050	13	1.41	0.13	1.24-1.59	13
3A	395	-	-	1	900	-	-	1	1.46	-	-	1
4	351	45	155-485	61	614	196	75-1725	61	1.40	0.19	0.77-2.01	61
5	344	17	316-375	12	556	132	400-825	12	1.35	0.20	1.14-1.88	12

Table A38-6.

Summary statistics for fork length, wet weight, and condition factor of shorthead redhorse captured in the Red and Assiniboine rivers, according to zone, September.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	243	-	-	1	225	-	-	1	1.57	-	-	1
1	372	91	308-436	2	800	495	450-1150	2	1.46	0.11	1.39-1.54	2
2	360	30	304-407	25	699	185	400-1075	24	1.47	0.14	1.16-1.70	24
3	336	62	217-415	16	660	279	250-1100	15	1.54	0.25	1.22-2.13	15
3A	370	34	346-394	2	870	255	690-1050	2	1.69	0.04	1.67-1.72	2
4	346	31	229-437	166	612	148	200-1250	162	1.46	0.14	1.20-1.88	162
5	329	58	196-390	9	581	235	150-950	9	1.56	0.20	1.29-1.99	9

Table A38-8.

Summary statistics for fork length, wet weight, and condition factor of shorthead redhorse captured in the Red and Assiniboine rivers, according to zone, July through October.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	272	41	243-301	2	313	124	225-400	2	1.52	0.07	1.47-1.57	2
1	361	67	308-436	3	717	379	450-1150	3	1.44	0.08	1.39-1.54	3
2	348	42	246-414	41	643	224	200-1100	40	1.47	0.16	1.09-1.80	40
3	347	54	200-437	44	669	246	100-1100	43	1.49	0.18	1.22-2.13	43
3A	378	28	346-395	3	880	181	690-1050	3	1.61	0.14	1.46-1.72	3
4	348	35	155-485	248	616	161	75-1725	244	1.44	0.16	0.77-2.01	244
5	337	39	196-390	21	567	178	150-950	21	1.44	0.22	1.14-1.99	21

Appendix 39. Fork lengths, wet weights, and condition factors of silver redhorse captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A39-1. Summary statistics for fork length, wet weight, and condition factor of silver redhorse captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	386	112	174-520	8	1053	722	50-2300	8	1.45	0.23	0.95-1.69	8
Assiniboine River		420	96	238-505	10	1217	622	225-1775	9	1.47	0.23	0.97-1.68	9
Red River	August	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	September	345	40	317-373	2	700	141	600-800	2	1.71	0.24	1.54-1.88	2
Assiniboine River		486	-	-	1	1725	-	-	1	1.50	-	-	1
Red River	October	506	41	477-535	2	2025	601	1600-2450	2	1.54	0.09	1.47-1.60	2
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	399	105	174-535	12	1156	741	50-2450	12	1.51	0.22	0.95-1.88	12
Assiniboine River		426	93	238-505	11	1268	608	225-1775	10	1.47	0.22	0.97-1.68	10

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A39-2.

Summary statistics for fork length, wet weight, and condition factor of silver redhorse captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
July	405	102	174-520	18	1140	655	50-2300	17	1.46	0.22	0.95-1.69	17
August	-	-	-	-	-	-	-	-	-	-	-	-
September	392	86	317-486	3	1042	600	600-1725	3	1.64	0.21	1.50-1.88	3
October	506	41	477-535	2	2025	601	1600-2450	2	1.54	0.09	1.47-1.60	2
July - October	412	98	174-535	23	1207	670	50-2450	22	1.49	0.21	0.95-1.88	22

Table 39-3. Summary statistics for fork length, wet weight, and condition factor of silver redhorse captured in the Red and Assiniboine rivers, according to zone, July.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	174	-	-	1	50	-	-	1	0.95	-	-	1
2	365	60	310-448	4	806	432	450-1400	4	1.54	0.12	1.41-1.69	4
3	451	-	-	1	1350	-	-	1	1.47	-	-	1
3A	499	30	478-520	2	1900	566	1500-2300	2	1.50	0.19	1.37-1.64	2
4	424	100	238-505	9	1256	652	225-1775	8	1.45	0.23	0.97-1.68	8
5	380	-	-	1	900	-	-	1	1.64	-	-	1

Table 39-6. Summary statistics for fork length, wet weight, and condition factor of silver redhorse captured in the Red and Assiniboine rivers, according to zone, July through October.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	435	-	-	1	1325	-	-	1	1.61	-	-	1
1	174	-	-	1	50	-	-	1	0.95	-	-	1
2	367	52	310-448	5	805	374	450-1400	5	1.54	0.10	1.41-1.69	5
3	445	92	317-535	4	1500	763	600-2450	4	1.61	0.19	1.47-1.88	4
3A	499	30	478-520	2	1900	566	1500-2300	2	1.50	0.19	1.37-1.64	2
4	430	97	238-505	10	1308	630	225-1775	9	1.45	0.22	0.97-1.68	9
5	380	-	-	1	900	-	-	1	1.64	-	-	1

Appendix 40. Fork lengths, wet weights, and condition factors of stonecat captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A40-1. Summary statistics for fork length, wet weight, and condition factor of stonecat captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	136	86	75-196	2	125	-	-	1	1.66	-	-	1
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	August	-	-	-	-	-	-	-	-	-	-	-	-
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	September	161	-	-	1	-	-	-	-	-	-	-	-
Assiniboine River		156	-	-	1	-	-	-	-	-	-	-	-
Red River	October	190	-	-	1	50	-	-	1	0.73	-	-	1
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	156	56	75-196	4	88	53	50-125	2	1.19	0.66	0.73-1.66	2
Assiniboine River		156	-	-	1	-	-	-	-	-	-	-	-

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A40-2.

Summary statistics for fork length, wet weight, and condition factor of stonecat captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	-	-	-	-	-	-	-	-	-	-	-	-
July	136	86	75-196	2	125	-	-	1	1.66	-	-	1
August	-	-	-	-	-	-	-	-	-	-	-	-
September	159	4	156-161	2	-	-	-	-	-	-	-	-
October	190	-	-	1	50	-	-	1	0.73	-	-	1
July - October	156	48	75-196	5	88	53	50-125	2	1.19	0.66	0.73-1.66	2

Appendix 41. Fork lengths, wet weights, and condition factors of walleye captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A41-1. Summary statistics for fork length, wet weight, condition factor of walleye captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	443	147	280-690	6	1217	1543	300-4300	6	1.03	0.29	0.66-1.37	6
Assiniboine River		488	-	-	1	1450	-	-	1	1.25	-	-	1
Red River	July	487	243	146-735	10	2323	2060	50-4850	10	1.27	0.17	1.08-1.61	10
Assiniboine River		628	149	388-750	5	3620	1955	650-5500	5	1.28	0.17	1.11-1.48	5
Red River	August	429	123	310-678	13	1169	1155	350-4350	13	1.18	0.14	1.02-1.53	13
Assiniboine River		342	-	-	1	500	-	-	1	1.25	-	-	1
Red River	September	402	129	288-724	10	1165	1692	225-5850	10	1.21	0.17	0.94-1.54	10
Assiniboine River		328	101	183-412	4	458	293	90-790	4	1.16	0.21	1.02-1.47	4
Red River	October	418	-	-	1	800	-	-	1	1.10	-	-	1
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	438	165	146-735	34	1496	1649	50-5850	34	1.21	0.16	0.94-1.61	34
Assiniboine River		479	194	183-750	10	2043	2119	90-5500	10	1.23	0.18	1.02-1.48	10

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A41-2. Summary statistics for fork length, wet weight, and condition factor of walleye captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March).	449	135	280-690	7	1250	1411	300-4300	7	1.06	0.28	0.66-1.37	7
July	534	221	146-750	15	2755	2055	50-5500	15	1.27	0.17	1.08-1.61	15
August	423	120	310-678	14	1121	1124	350-4350	14	1.18	0.13	1.02-1.53	14
September	381	123	183-724	14	963	1453	90-5850	14	1.19	0.17	0.94-1.54	14
October	418	-	-	1	800	-	-	1	1.10	-	-	1
July - October	447	171	146-750	44	1621	1755	50-5850	44	1.22	0.16	0.94-1.61	44

Table A41-3. Summary statistics for fork length, wet weight, and condition factor of walleye captured in the Red and Assiniboine rivers, according to zone, February and March.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	690	-	-	1	4300	-	-	1	1.31	-	-	1
2	-	-	-	-	-	-	-	-	-	-	-	-
3	393	93	280-502	5	600	350	300-1175	5	0.97	0.28	0.66-1.37	5
3A	-	-	-	-	-	-	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-
5	488	-	-	1	1450	-	-	1	1.25	-	-	1

Table A41-4. Summary statistics for fork length, wet weight, and condition factor of walleye captured in the Red and Assiniboine rivers, according to zone, July.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	470	-	-	1	1125	-	-	1	1.08	-	-	1
1	704	21	680-718	3	4392	609	3700-4850	3	1.25	0.08	1.18-1.34	3
2	548	163	438-735	3	2217	2066	925-4600	3	1.11	0.04	1.08-1.16	3
3	280	225	146-615	4	850	1567	50-3200	4	1.39	0.19	1.14-1.61	4
3A	-	-	-	-	-	-	-	-	-	-	-	-
4	688	74	581-750	4	4363	1193	2900-5500	4	1.33	0.17	1.15-1.48	4
5	388	-	-	1	650	-	-	1	1.11	-	-	1

Table A41-6. Summary statistics for fork length, wet weight, and condition factor of walleye captured in the Red and Assiniboine rivers, according to zone, September.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-	-	-
2	413	176	288-724	5	1505	2432	225-5850	5	1.16	0.23	0.94-1.54	5
3	393	131	300-485	2	875	778	325-1425	2	1.23	0.03	1.20-1.25	2
3A	389	60	332-451	3	792	406	475-1250	3	1.27	0.11	1.16-1.36	3
4	300	103	183-378	3	347	235	90-550	3	1.17	0.26	1.02-1.47	3
5	412	-	-	1	790	-	-	1	1.13	-	-	1

Table A41-8. Summary statistics for fork length, wet weight, and condition factor of walleye captured in the Red and Assiniboine rivers, according to zone, July through October.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	470	-	-	1	1125	-	-	1	1.08	-	-	1
1	704	21	680-718	3	4392	609	3700-4850	3	1.25	0.08	1.18-1.34	3
2	430	134	288-735	20	1251	1483	225-5850	20	1.15	0.14	0.94-1.54	20
3	375	207	146-678	8	1288	1634	50-4350	8	1.32	0.17	1.10-1.61	8
3A	389	60	332-451	3	792	406	475-1250	3	1.27	0.11	1.16-1.36	3
4	499	215	183-750	8	2374	2269	90-5500	8	1.26	0.19	1.02-1.48	8
5	400	17	388-412	2	720	99	650-790	2	1.12	0.01	1.11-1.13	2

Appendix 42. Fork lengths, wet weights, and condition factors of white sucker captured in the Red and Assiniboine rivers, according to month, river and zone.

Table A42-1. Summary statistics for fork length, wet weight, and condition factor of white sucker captured in the Red and Assiniboine rivers.

River ¹	Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
		Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Red River	Winter (February and March)	406	41	298-470	31	1087	344	375-1700	31	1.57	0.13	1.32-1.96	31
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July	354	41	192-408	60	635	197	100-950	59	1.38	0.12	0.99-1.62	59
Assiniboine River		362	54	216-440	18	718	257	140-1100	18	1.44	0.11	1.29-1.71	18
Red River	August	376	46	255-483	36	869	274	300-1600	36	1.59	0.20	1.27-2.19	36
Assiniboine River		370	35	335-400	4	750	235	550-1000	4	1.45	0.09	1.36-1.56	4
Red River	September	383	29	315-463	77	848	214	475-1500	77	1.49	0.11	1.23-1.75	77
Assiniboine River		380	19	348-413	22	826	139	600-1100	22	1.49	0.13	1.26-1.85	22
Red River	October	401	35	350-480	28	939	274	500-1600	28	1.42	0.15	1.01-1.79	28
Assiniboine River		-	-	-	-	-	-	-	-	-	-	-	-
Red River	July - October	375	40	192-483	201	802	254	100-1600	200	1.47	0.15	0.99-2.19	200
Assiniboine River		372	39	216-440	44	775	205	140-1100	44	1.47	0.12	1.26-1.85	44

¹ Red River includes zones 1 - 3 and 3A; zone 1A is excluded

Table A42-2.

Summary statistics for fork length, wet weight, and condition factor of white sucker captured in the Red and Assiniboine rivers, according to season. Red River includes zones 1 - 3 and 3A; zone 1A is excluded.

Season	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
Winter (February and March)	406	41	298-470	31	1087	344	375-1700	31	1.57	0.13	1.32-1.96	31
July	356	44	192-440	78	654	213	100-1100	77	1.40	0.12	0.99-1.71	77
August	376	45	255-483	40	857	270	300-1600	40	1.57	0.19	1.27-2.19	40
September	382	27	315-463	99	843	199	475-1500	99	1.49	0.12	1.23-1.85	99
October	401	35	350-480	28	939	274	500-1600	28	1.42	0.15	1.01-1.79	28
July - October	375	40	192-483	245	797	246	100-1600	244	1.47	0.15	0.99-2.19	244

Table A42-4. Summary statistics for fork length, wet weight, and condition factor of white sucker captured in the Red and Assiniboine rivers, according to zone, July.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	335	-	-	1	475	-	-	1	1.26	-	-	1
2	342	45	246-405	14	577	207	175-900	14	1.37	0.09	1.18-1.50	14
3	358	40	192-408	45	657	193	100-950	44	1.39	0.13	0.99-1.62	44
3A	-	-	-	-	-	-	-	-	-	-	-	-
4	372	42	292-440	15	757	219	400-1100	15	1.44	0.12	1.29-1.71	15
5	315	93	216-400	3	522	393	140-925	3	1.41	0.03	1.39-1.45	3

Table A42-8. Summary statistics for fork length, wet weight, and condition factor of white sucker captured in the Red and Assiniboine rivers, according to zone, July through October.

Zone	Fork Length (mm)				Wet Weight (g)				Condition Factor (K)			
	Mean	S.D.	Range	n	Mean	S.D.	Range	n	Mean	S.D.	Range	n
1A	-	-	-	-	-	-	-	-	-	-	-	-
1	395	50	335-460	5	970	409	475-1500	5	1.49	0.14	1.26-1.63	5
2	369	43	246-463	61	757	250	175-1300	61	1.45	0.13	1.01-1.81	61
3	376	38	192-483	132	805	239	100-1600	131	1.47	0.16	0.99-2.19	131
3A	424	36	385-457	3	1267	236	1000-1450	3	1.66	0.12	1.52-1.75	3
4	376	30	292-440	41	793	180	400-1100	41	1.47	0.12	1.26-1.85	41
5	315	93	216-400	3	522	393	140-925	3	1.41	0.03	1.39-1.45	3

Appendix 43. Species names and codes of fish captured in the Red and Assiniboine rivers, 1999.

Appendix 43.

Species names and codes of fish captured in the Red and Assiniboine rivers, 1999.

Species code	Common name	Latin name
BGBF	Bigmouth buffalo	<i>Ictiobus cyprinellus</i>
BLBL	Black bullhead	<i>Amieurus melas</i>
BLCR	Black crappie	<i>Pomoxis nigromaculatus</i>
BRBL	Brown bullhead	<i>Amieurus nebulosus</i>
BURB	Burbot	<i>Lota lota</i>
CARP	Carp	<i>Cyprinus carpio</i>
CHCT	Channel catfish	<i>Ictalurus punctatus</i>
FRDR	Freshwater drum	<i>Aplodinotus grunniens</i>
GLRD	Golden redhorse	<i>Moxostoma erythrurum</i>
GOLD	Goldeye	<i>Hiodon alosoides</i>
LKCS	Lake cisco	<i>Coregonus artedii</i>
MOON	Mooneye	<i>Hiodon tergisus</i>
NRPK	Northern pike	<i>Esox lucius</i>
QUIL	Quillback	<i>Carpiodes cyprinus</i>
RCBS	Rock bass	<i>Ambloplites rupestris</i>
SAUG	Sauger	<i>Stizostedion canadense</i>
SHRD	Shorthead redhorse	<i>Moxostoma macrolepidotum</i>
SLRD	Silver redhorse	<i>Moxostoma anisurum</i>
STCT	Stonecat	<i>Noturus flavus</i>
WALL	Walleye	<i>Stizostedion vitreum</i>
WHSC	White sucker	<i>Catostomus commersoni</i>