

Antimicrobial Use Surveillance in Canadian Aquaculture

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Canada

A few considerations before we begin

- Different datasets are presented throughout this talk, including antimicrobial **sales** (VASR) and **prescription**/use data (DFO)
- **Data source abbreviations:** AMU-DFO = DFO farm-level antimicrobial use data; VASR = Veterinary Antimicrobial Sales Reporting data
- Data availability varies by source; therefore, some figures extend to 2025 while others currently end in 2024
- Multiple measures of antimicrobial use (AMU) are presented (kg active ingredient, mg/kg biomass, and DDDvetCA), each highlighting a different aspect of antimicrobial use
- Trends should generally be interpreted within, rather than across, individual metrics and data sources
- Although inland provinces contribute approximately 7% of harvested aquaculture biomass, they account for less than 1% of reported antimicrobial use (kg). Consequently, this presentation focuses primarily on British Columbia and Atlantic Canada

Aquaculture in Canada: what antimicrobial use data do we have?

- **Sales data**
  - The **Veterinary Antimicrobial Sales Reporting (VASR)** system
  - National antimicrobial sales intended for use in animals (PHAC and Health Canada)
    - ***Manufacturers, importers*** and compounders
    - Medically important antimicrobials
- **Use data**
  - **Prescription data** (Department of Fisheries and Oceans (DFO))
  - Farm-level (who uses what and how much)
- **Characteristics of these systems**
  - Mandatory regulatory data collection
  - Harmonized national coverage
  - Longitudinal data for trend analysis
  - Data validation and quality assurance
  - **A robust foundation for surveillance!**



An overview .. but with important limitations

AMU in aquaculture ⟶ Census-based data

- **System strengths**
  - Complete national coverage
    - Based on sales and prescription data
  - Robust, continuous data collection

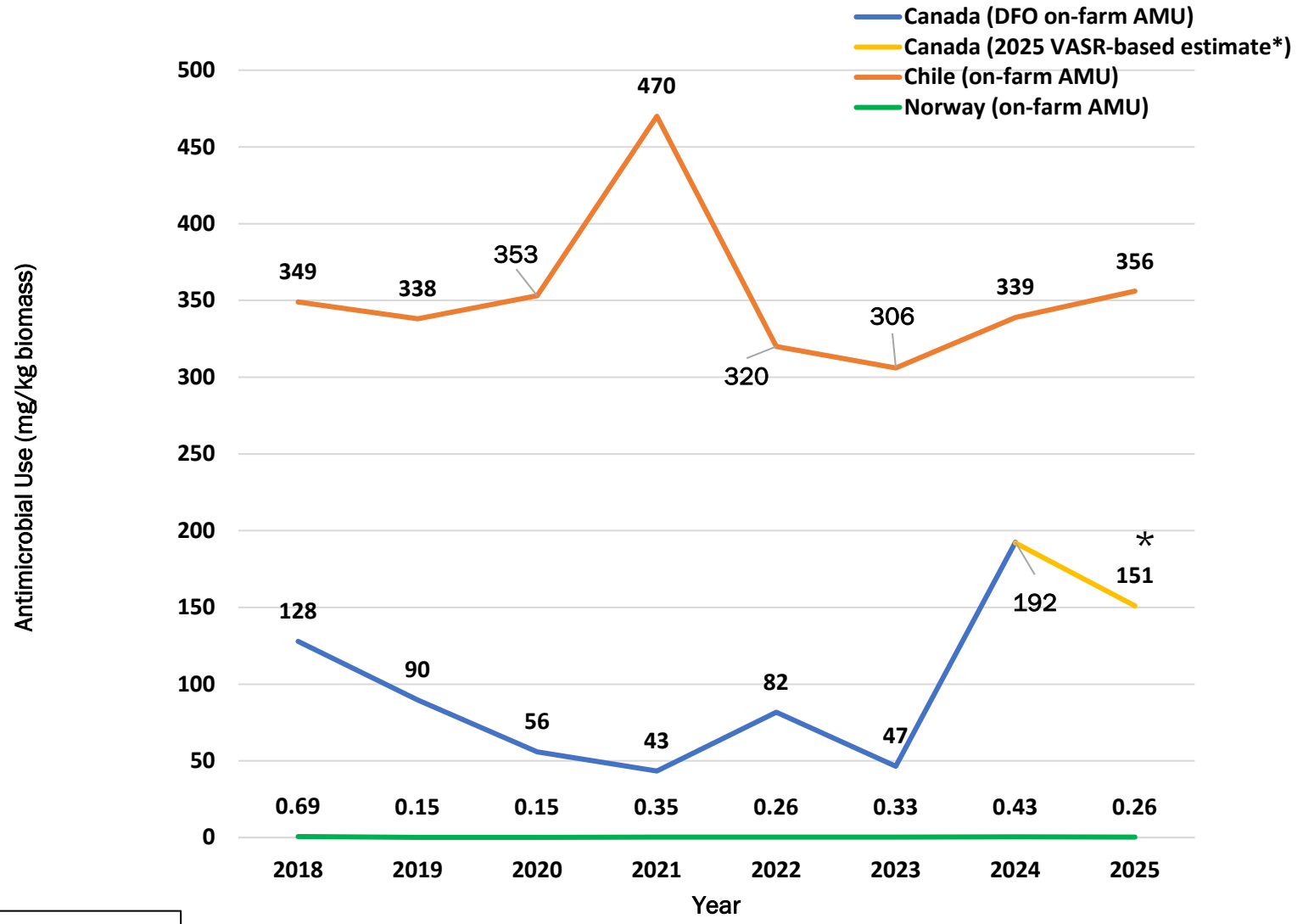
- **Limitations**
  - Sales data do not necessarily reflect actual use
  - Species and provincial estimates have uncertainty
  - Limited understanding of why and how antimicrobials are used

AMR in aquaculture

- Limited coverage
- AMRNetvet ⟶ laboratory antimicrobial susceptibility data
- Foodnet Canada ⟶ retail product sampling/testing
- No systematic farm-based surveillance

Comparison of antimicrobial use in aquaculture among major salmon-producing countries

- Canadian AMU remained substantially lower than Chilean AMU over time
- Norwegian AMU remained substantially lower than both Canada and Chile
- Following the increase observed in 2024, Canadian aquaculture AMU declined to an estimated 151 mg/kg in 2025



https://www.fiskeridir.no/english/aquaculture/statistics-for-aquaculture/comprehensive-statistics-on-norwegian-aquaculture
https://www.fhi.no/contentassets/e371695f1b4f4b56bb936c7fca0770e2/norm-norm-vet-2025-endelig-versjon-med-omslag.pdf
CIPARS-VASR (Public Health Agency of Canada and Health Canada)
Statistics Canada; https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3210010701
https://www.sernapesca.cl/area-trabajo/acuicultura/

*The 2025 Canadian value estimated from VASR antimicrobial sales data. Previous Canadian values are based on DFO farm-level AMU data.

Antimicrobial use and sales at the national level in aquaculture

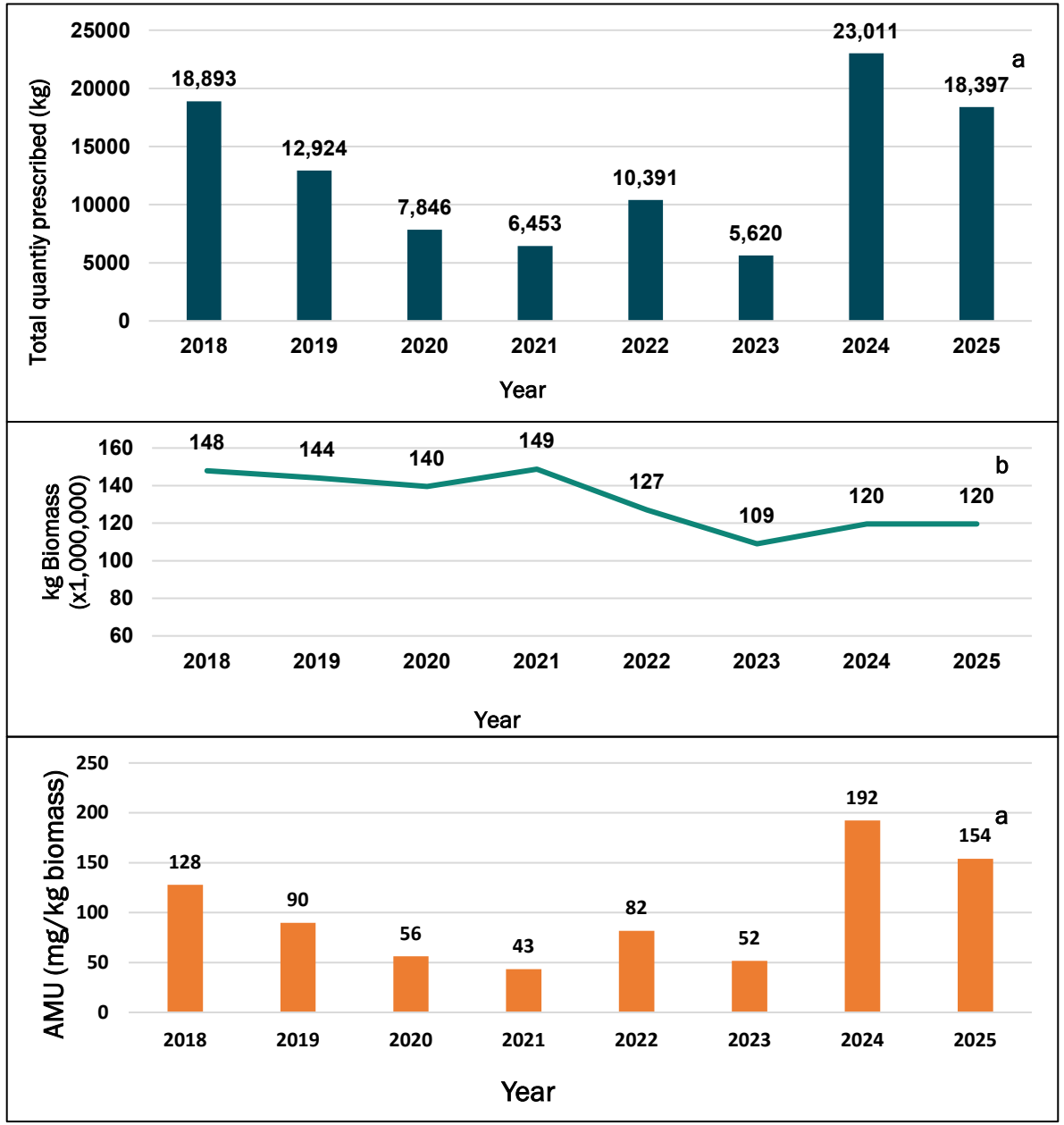
- National antimicrobial sales and use in aquaculture followed similar trends from 2020-2024
- Both measures increased substantially in 2024
- Potential contributing factors:
  - Changes in biomass
  - Disease outbreaks
  - Treatment approaches
- Preliminary VASR data for 2025 indicate an approximate 22% decrease in both kgs sold and mg/kg biomass
- DFO antimicrobial use data for 2025 were not available at the time of analysis



DFO prescription data;
https://open.canada.ca/data/en/dataset/288b6dc4-16dc-43cc-80a4-2a45b1f93383
CIPARS-VASR (Public Health Agency of Canada and Health Canada)

Comparison of total antimicrobials prescribed, total biomass produced and mg (prescribed)/kg biomass at the national level

- Total antimicrobials prescribed and AMU (mg/kg biomass) followed similar trends
- Harvested biomass declined overall after 2018 but increased by 10% in 2024
- Changes in biomass alone do not explain the increase in AMU



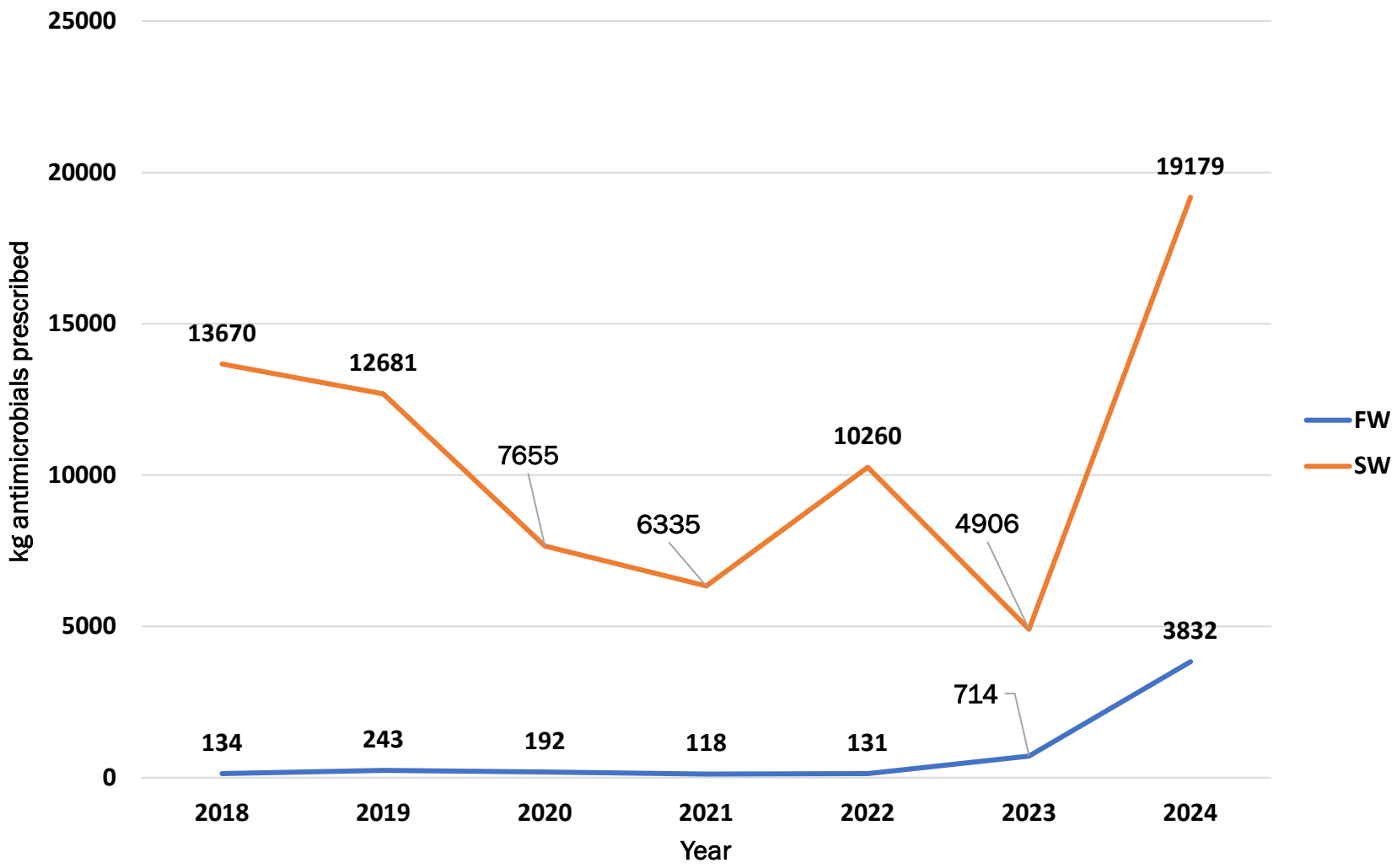
[a] 2025 AMU estimated from VASR antimicrobial sales data
[b] 2025 biomass estimated from 2024 data

DFO prescription data;
https://open.canada.ca/data/en/dataset/288b6dc4-16dc-43cc-80a4-2a45b1f93383

• National trends in prescribed antimicrobials in freshwater (FW) and saltwater (SW) aquaculture (AMU-DFO)

AMU increased in both sectors between 2018 and 2024

- Saltwater accounted for approximately 84% of AMU in 2024
- The relative increase was greater in freshwater than in saltwater
- National-level data may mask regional and species-specific variation



DFO prescription data
https://open.canada.ca/data/en/dataset/288b6dc4-16dc-43cc-80a4-2a45b1f93383

Aquaculture

Sales of medically important antimicrobials by **manufacturers** and **importers** were primarily Category III antimicrobials, with smaller quantities of Category II antimicrobials.

- Top classes include **tetracyclines** and **amphenicols**

There were no Category I or Uncategorized Medically Important antimicrobials sold for use in aquaculture.

Sales were primarily for use in feed, with smaller quantities for use by injection.

There are small quantities of antimicrobials reported each year by **compounders** for use in aquaculture, largely for topical use or use by injection (data not shown).

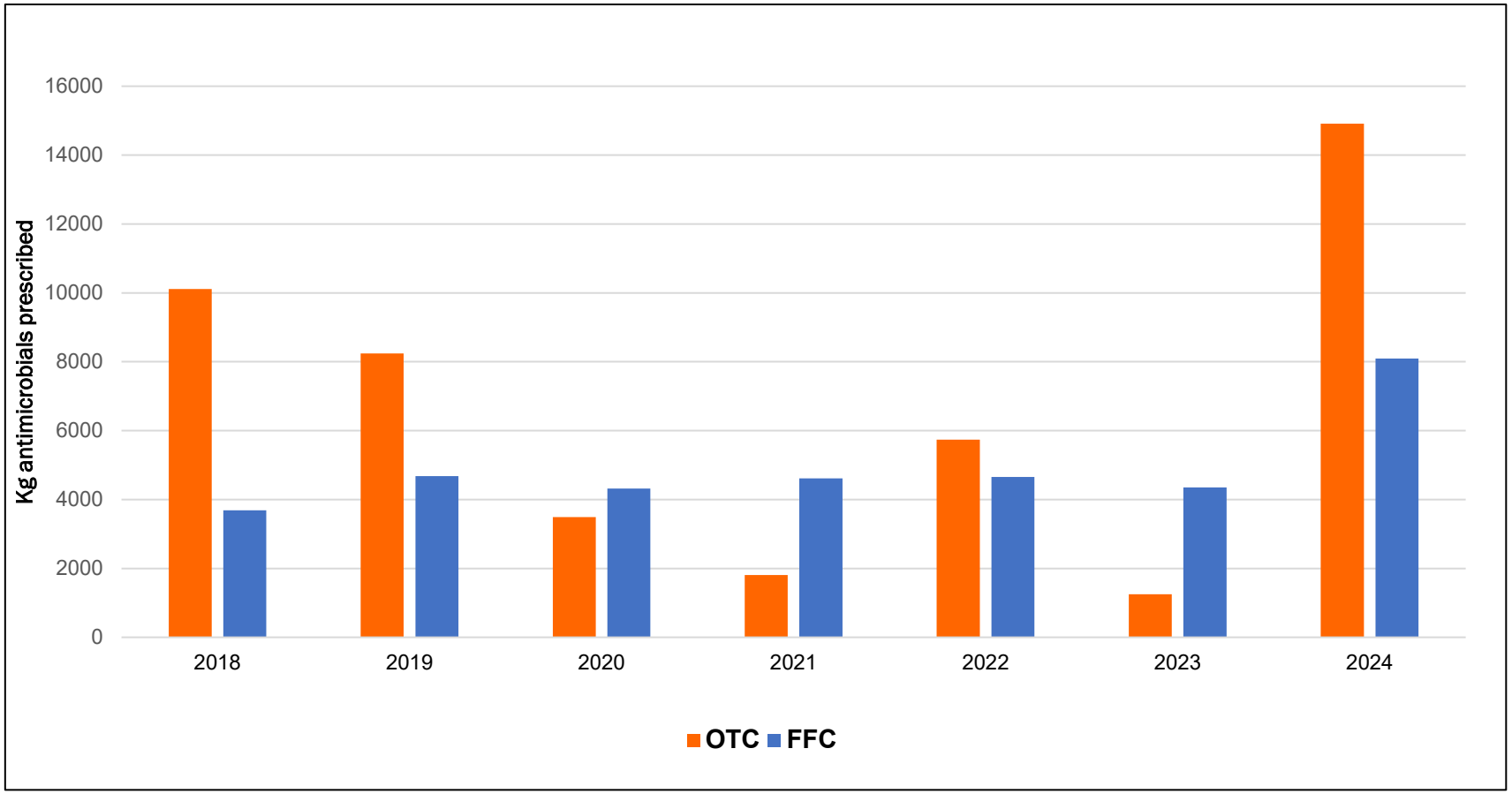
Category of Importance	Trends (mg/kg biomass) 2018-2025
Category I (very high importance)	
Category II (high importance)	
Category III (medium importance)	
Uncategorized Medically Important	

CIPARS-VASR

Note: Uncategorized medically important antimicrobials can include: aminocoumarins, gramidcin, orthosomycins, pleuromutilins and pseudomonic acids

National antimicrobial use trends from prescription data (AMU-DFO)

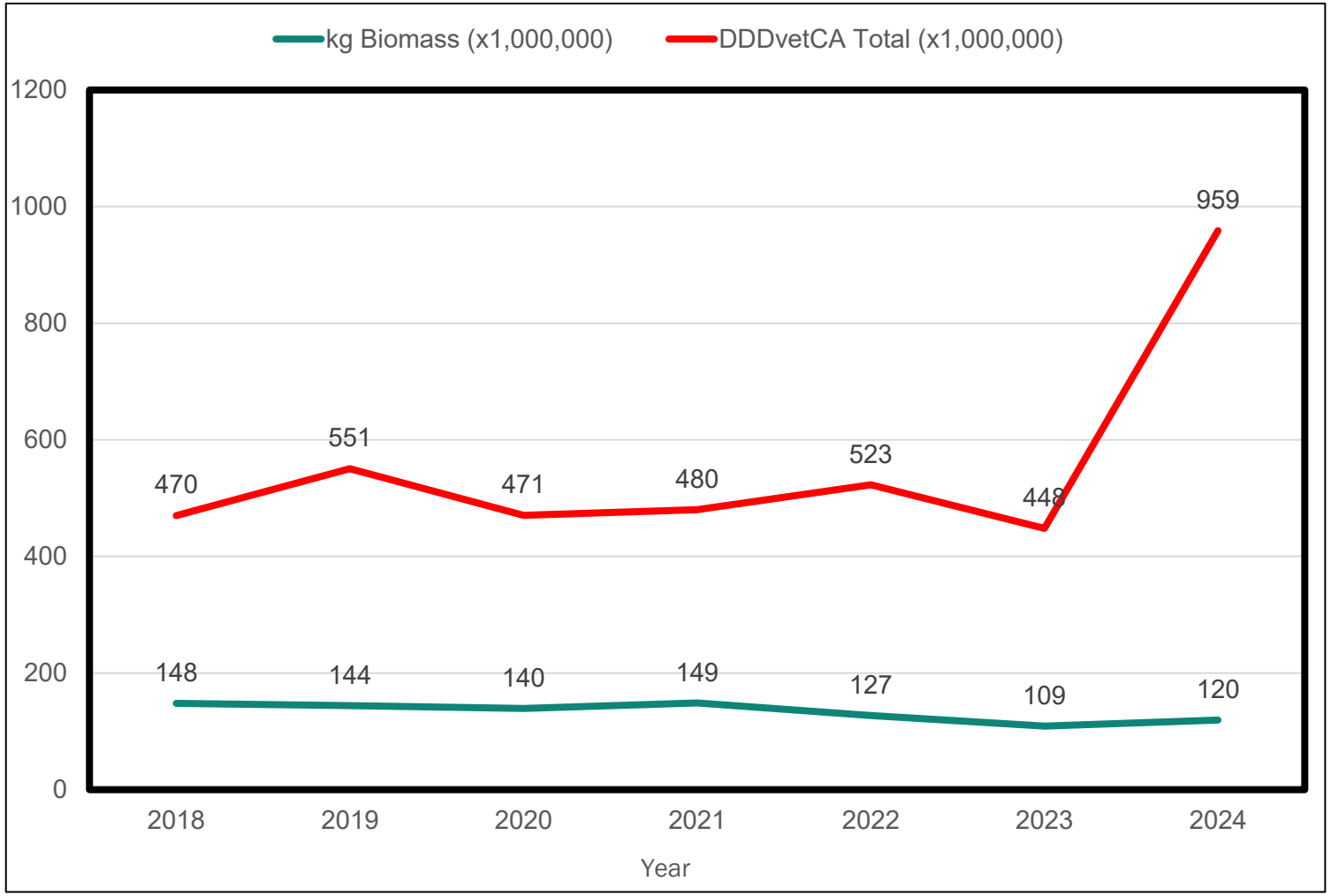
- Oxytetracycline (OTC) and florfenicol (FFC) accounted for most reported antimicrobial use in Canadian aquaculture
- Reported use of both OTC and FFC increased substantially in 2024, particularly OTC
- Differences in reported quantities may partly reflect differences in dosage rates, with OTC typically administered at 100 mg/kg and FFC at 10 mg/kg



DFO prescription data
https://open.canada.ca/data/en/dataset/288b6dc4-16dc-43cc-80a4-2a45b1f93383

Comparison of national fish biomass and total doses of antimicrobials prescribed (AMU-DFO)

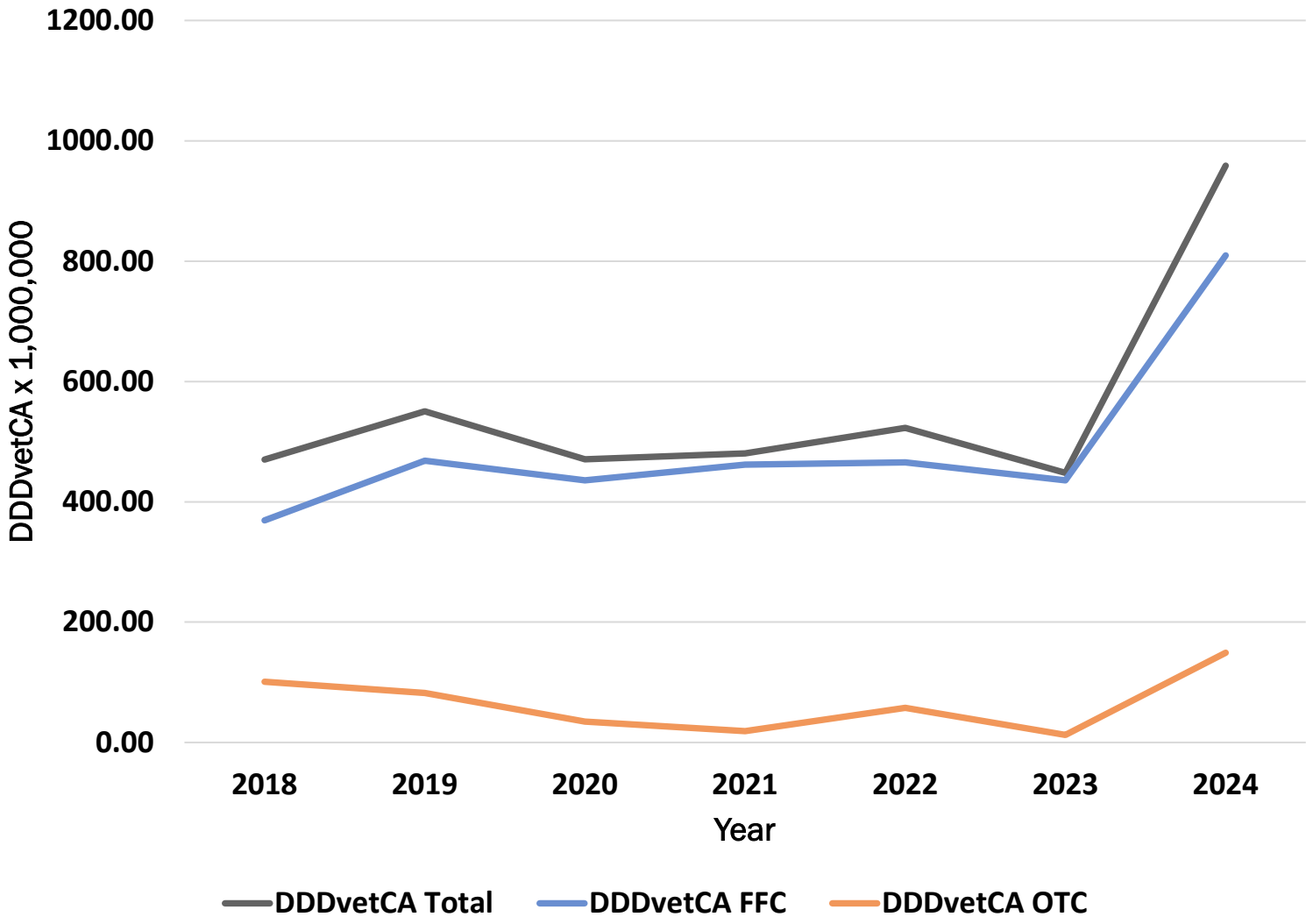
- Total antimicrobial doses prescribed, measured as DDDvetCA, increased markedly between 2023 and 2024
- Harvested biomass increased only modestly over the same period
- The increase reflects a greater number of treatment doses, not simply an increase in antimicrobial weight.



DFO prescription data
https://open.canada.ca/data/en/dataset/288b6dc4-16dc-43cc-80a4-2a45b1f93383

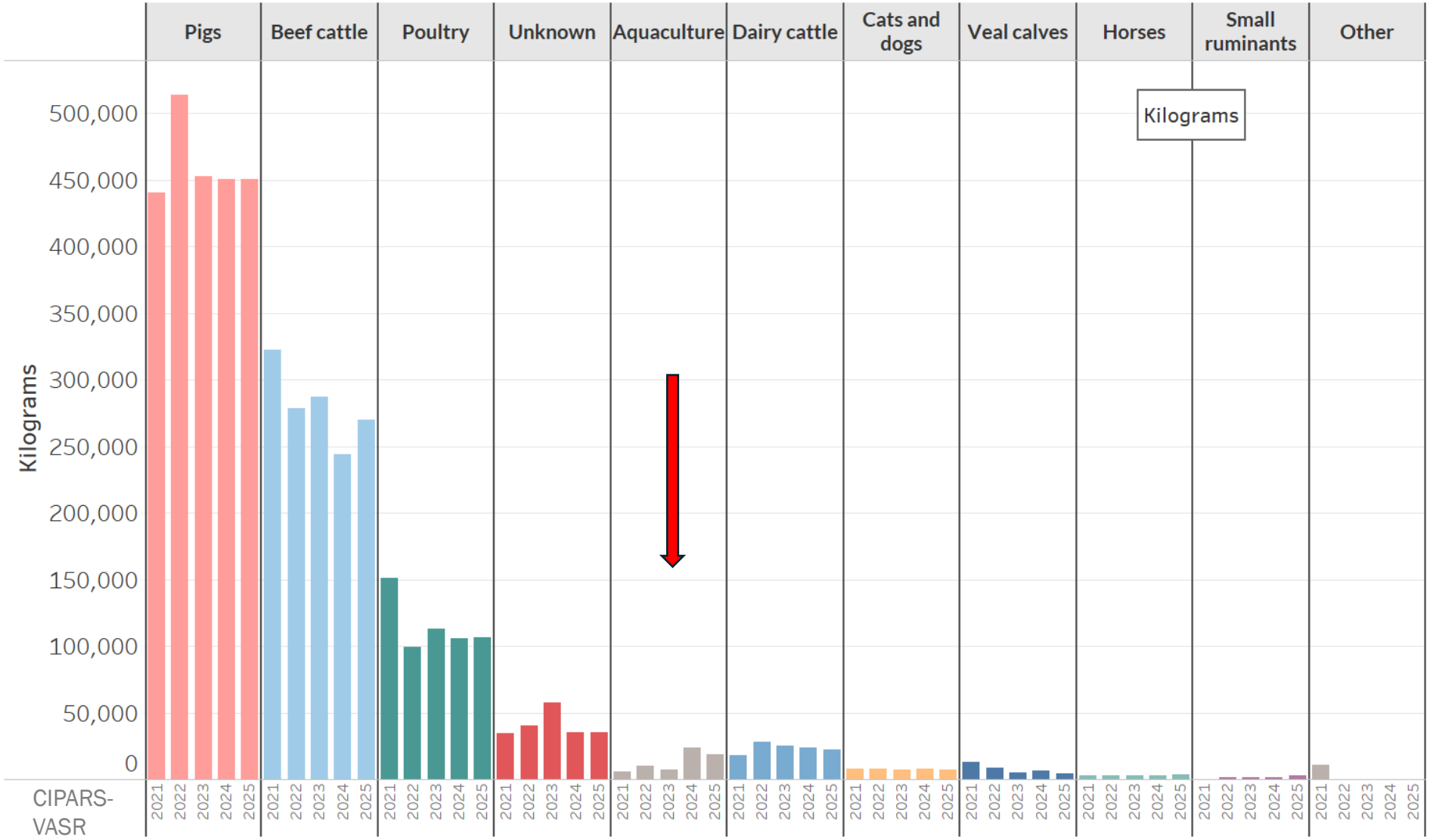
National trends in Defined Daily Doses prescribed (AMU-DFO)

- FFC accounted for most treatment doses throughout the period
- OTC accounted for fewer doses, but also increased substantially in 2024
- Both FFC and OTC contributed to the increase
- Macrolide was also reported, but quantities were too small to be visible at this scale.



DFO prescription data
https://open.canada.ca/data/en/dataset/288b6dc4-16dc-43cc-80a4-2a45b1f93383

Antimicrobials sales for use in animals, measured in kg, are primarily associated with pigs, beef cattle, and poultry production (VASR)

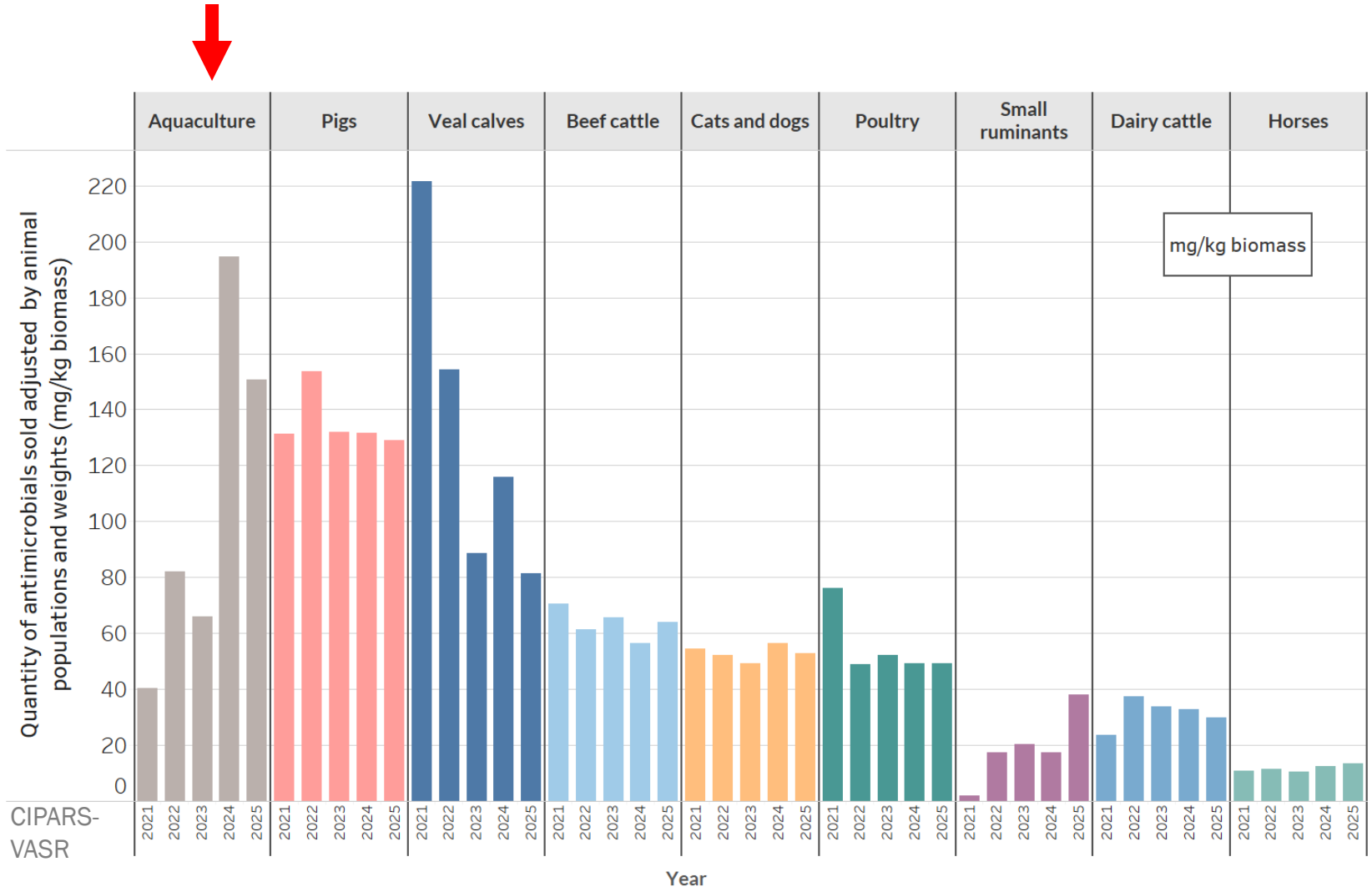


- Aquaculture represents a relatively small proportion of total antimicrobial sales in Canada

CIPARS-VASR (Public Health Agency of Canada and Health Canada)

Adjusting national sales of antimicrobials by biomass (VASR)

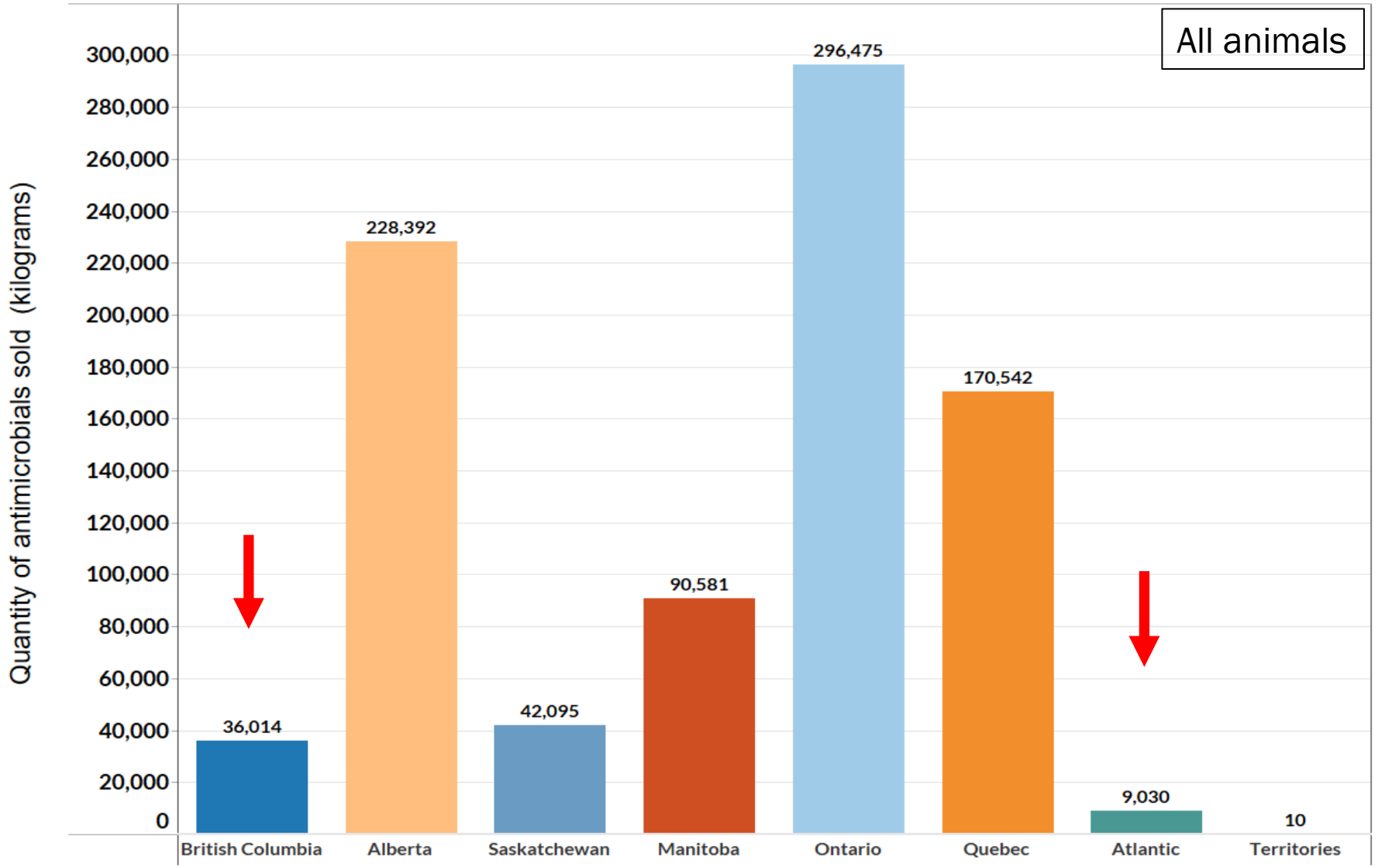
- Adjusting antimicrobials sales by biomass substantially changes the interpretation of sales trends
- Aquaculture sales adjusted by biomass peaked in 2024 and then declined in 2025
- Aquaculture had the highest biomass adjusted sales (mg/kg biomass) among production sectors in 2024 and 2025



CIPARS-VASR (Public Health Agency of Canada and Health Canada)

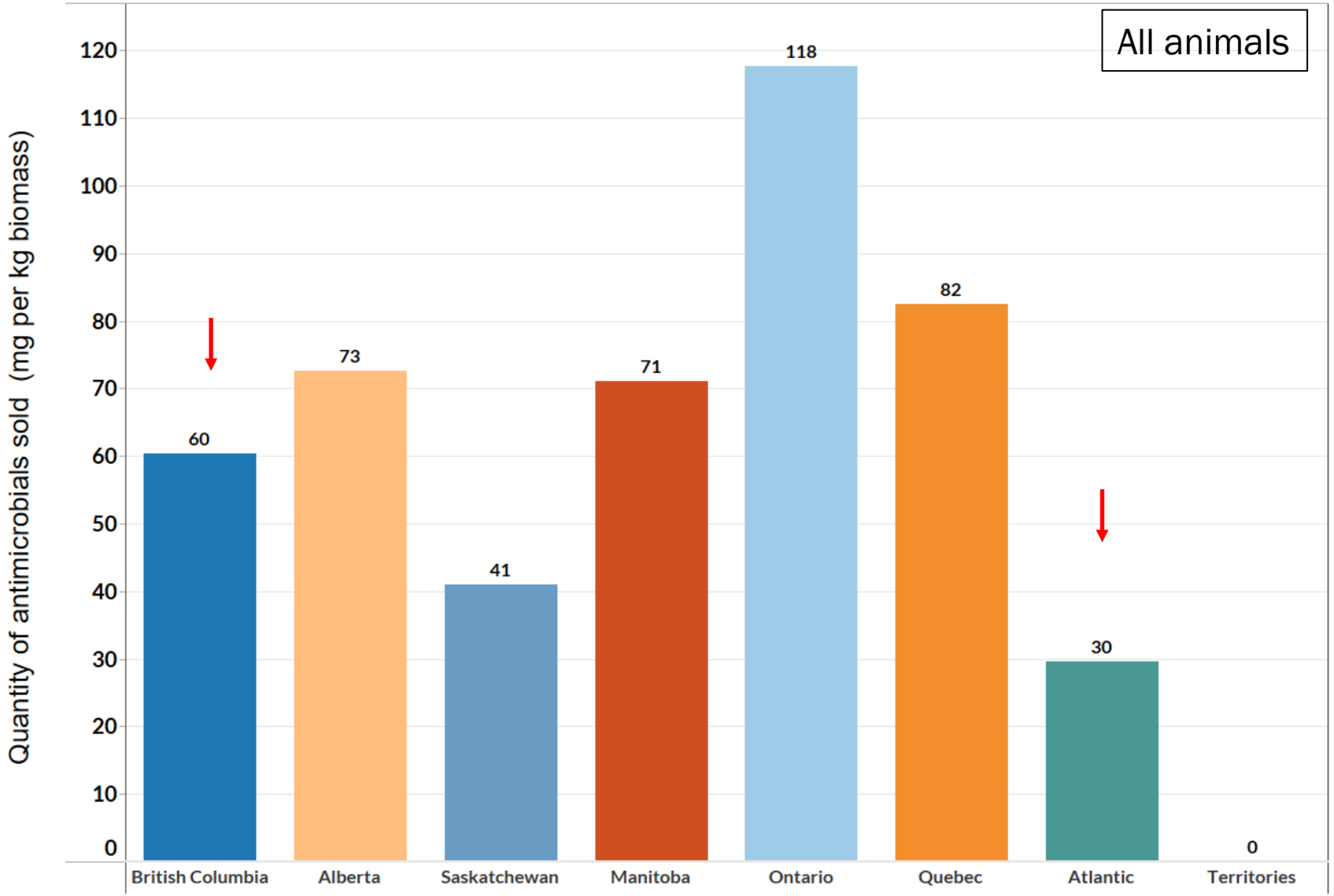
Provincial antimicrobial sales in kg in 2025 (VASR); all production sectors

- Ontario, Alberta and Quebec accounted for the largest antimicrobial sales volumes in Canada
- British Columbia and Atlantic Canada accounted for a relatively smaller proportion of national sales
- These regions contain most of Canada's aquaculture production.



https://health-infobase.canada.ca/cipars/antimicrobial-sales-use.html

Provincial antimicrobial sales in mg/kg in 2025 (VASR); all production sectors

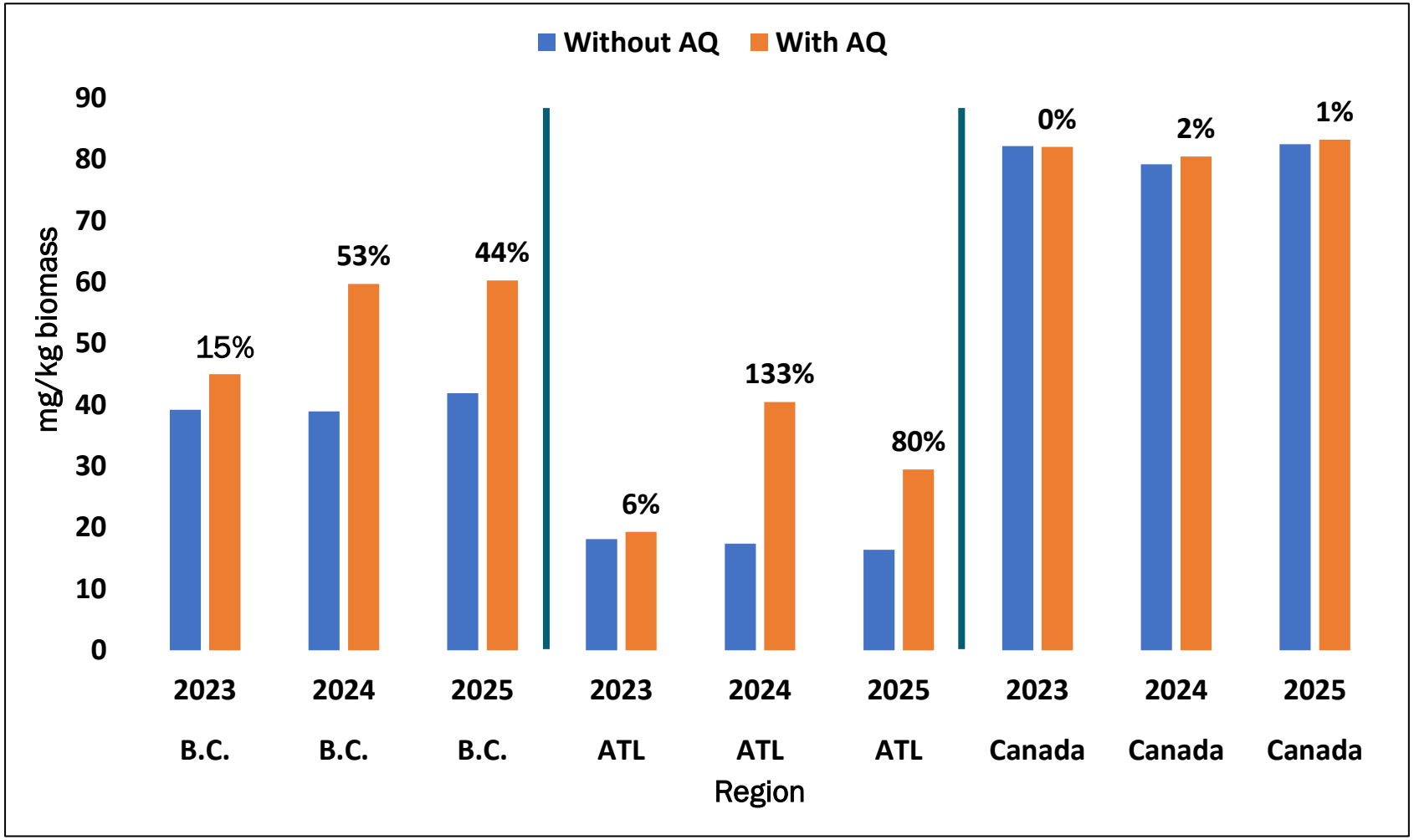


- The choice of denominator influences how provincial antimicrobial sales are interpreted
- Adjusting for the biomass substantially changes the interpretation of regional AMU indicators

https://health-infobase.canada.ca/cipars/antimicrobial-sales-use.html

Effect of including aquaculture in regional indicators (VASR sales data)

- Including aquaculture (AQ) had little effect on national indicators (0-2%)
- Aquaculture substantially influenced indicators in major aquaculture producing regions
- Regional biomass-adjusted indicators increased from 15% to 53% in B.C. and 6% to 133% when aquaculture was included

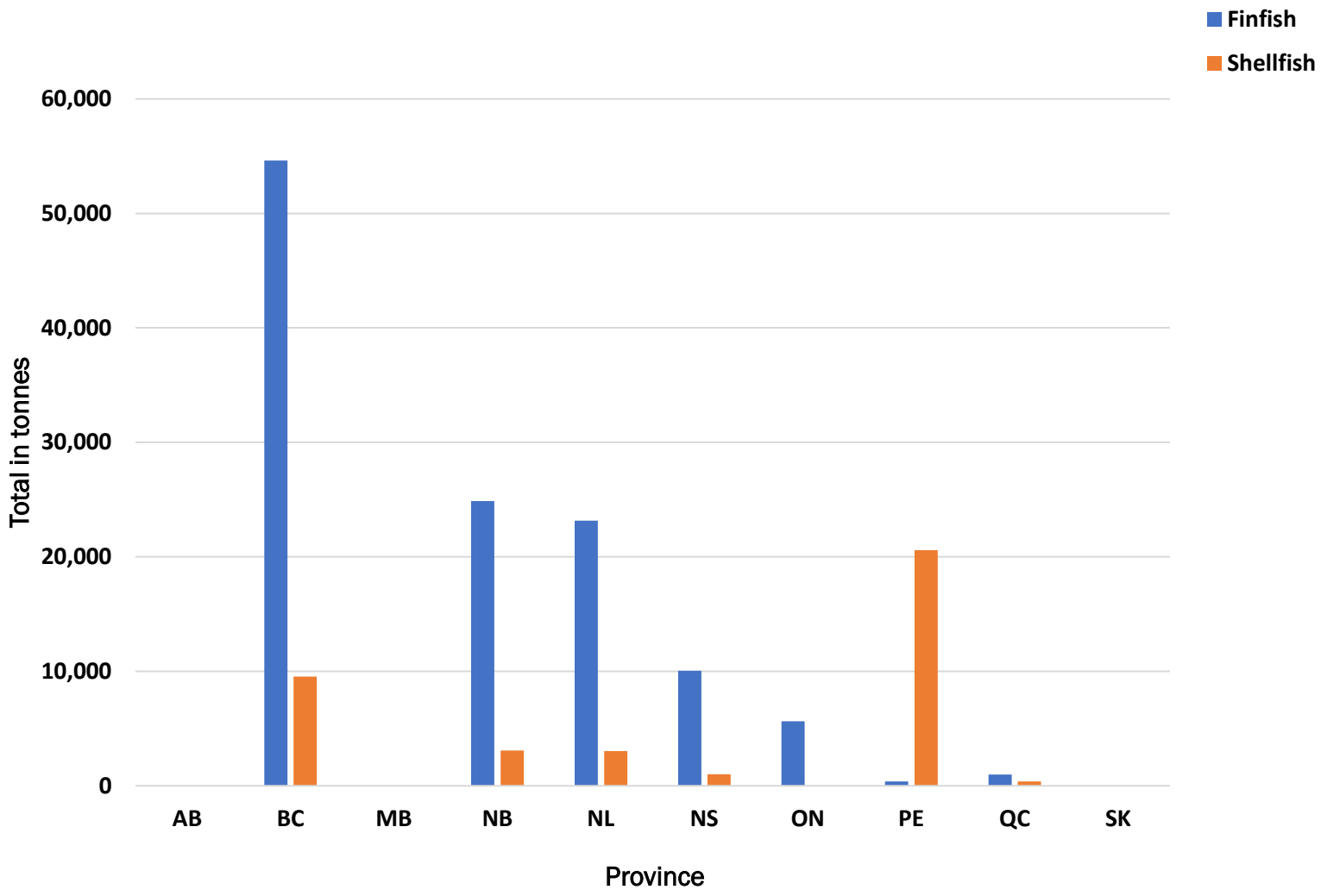


CIPARS-VASR (Public Health Agency of Canada and Health Canada)

AMU estimated from VASR antimicrobial sales data
2025 biomass estimated from 2024 Statistics Canada data

Harvested aquaculture by province and production type (2024)

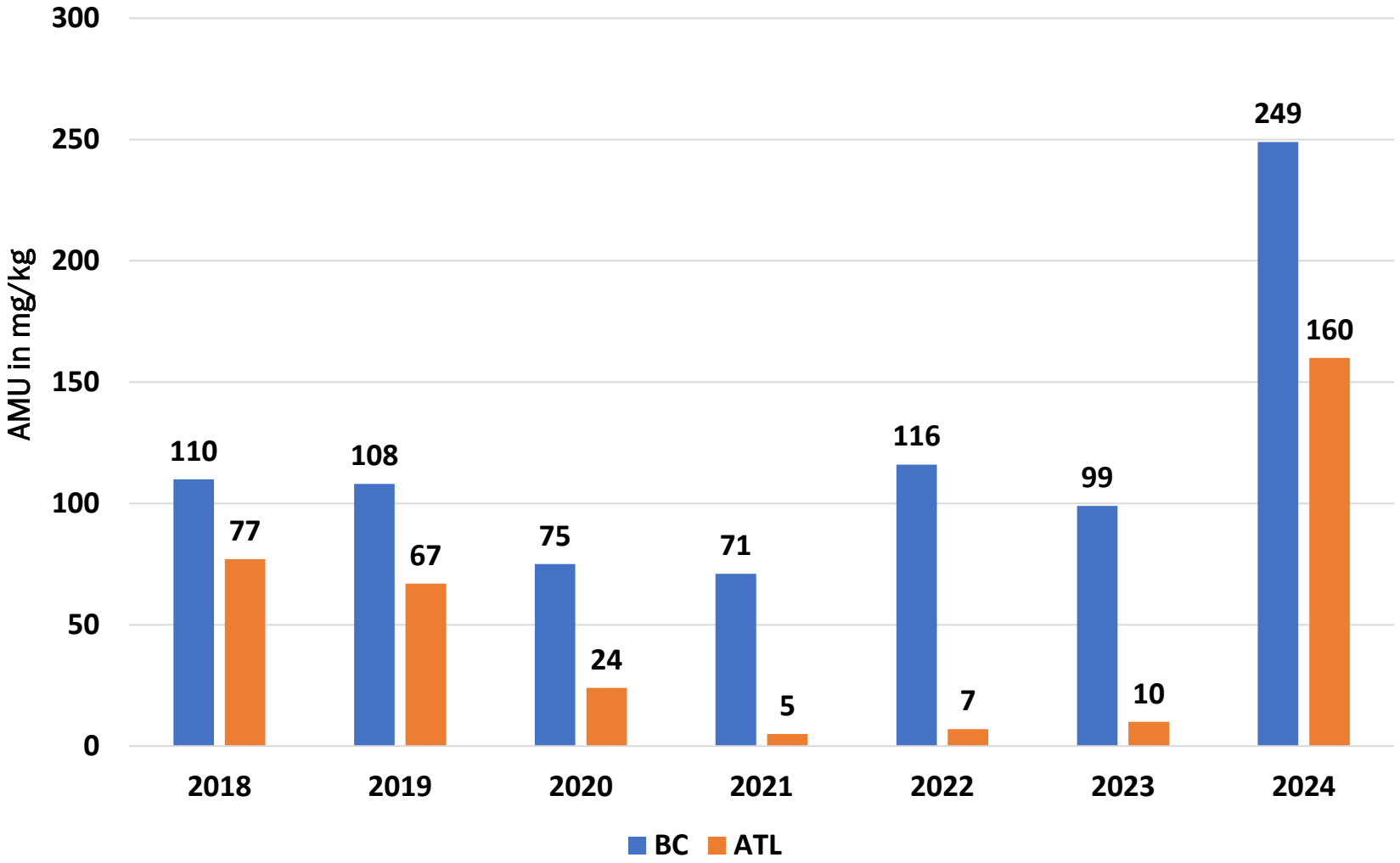
- BC, NB, NL and NS accounted for approximately 94% of Canadian aquaculture in 2024
- Finfish production was concentrated primarily in B.-C. and Atlantic Canada
- This production distribution helps explain provincial patterns observed in antimicrobial use



Statistics Canada; https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3210010701

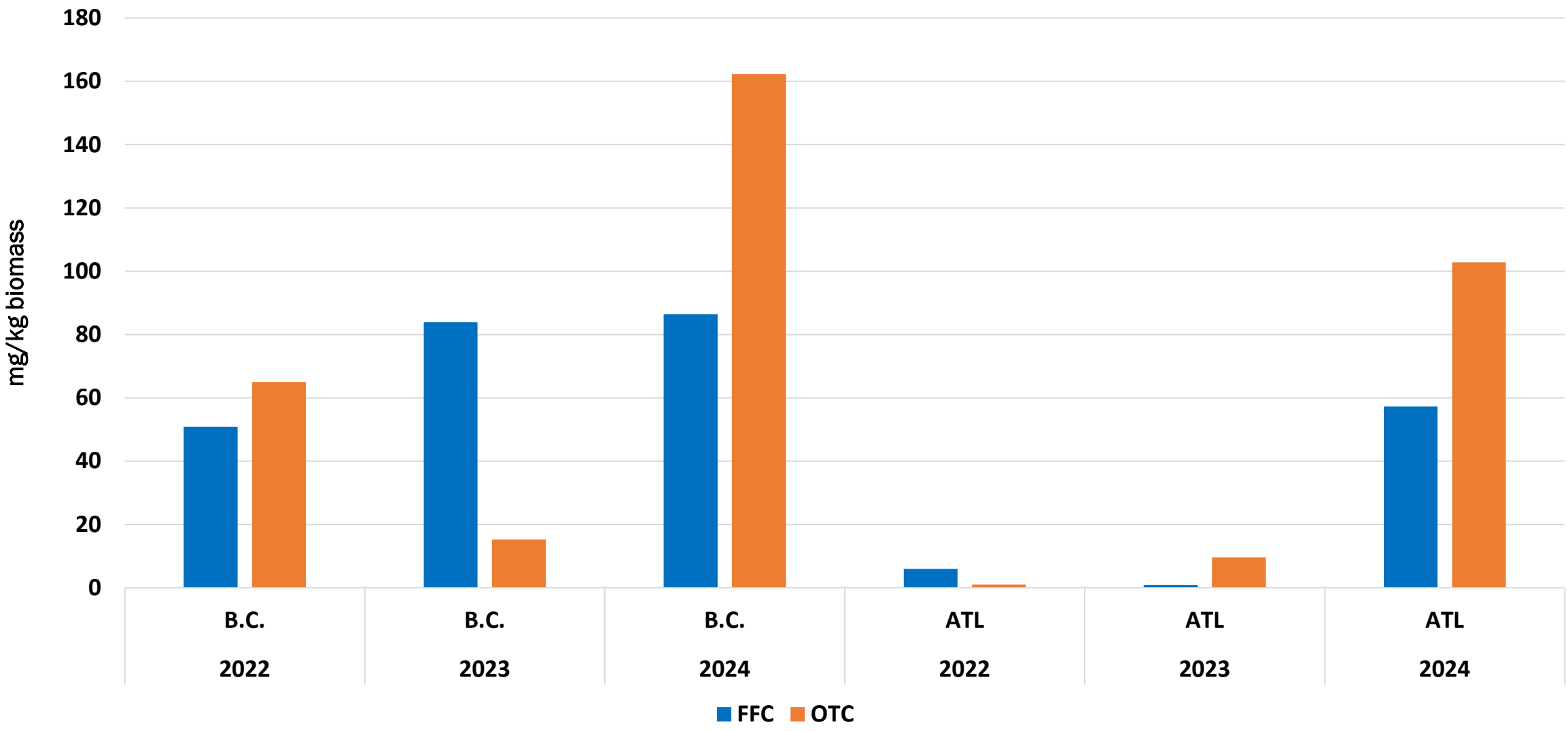
Trends in AMU prescribed in BC and Atlantic Canada (AMU-DFO)

- AMU remained consistently higher in BC than Atlantic Canada throughout the reporting period
- Both regions showed substantial increases in 2024



DFO prescription data
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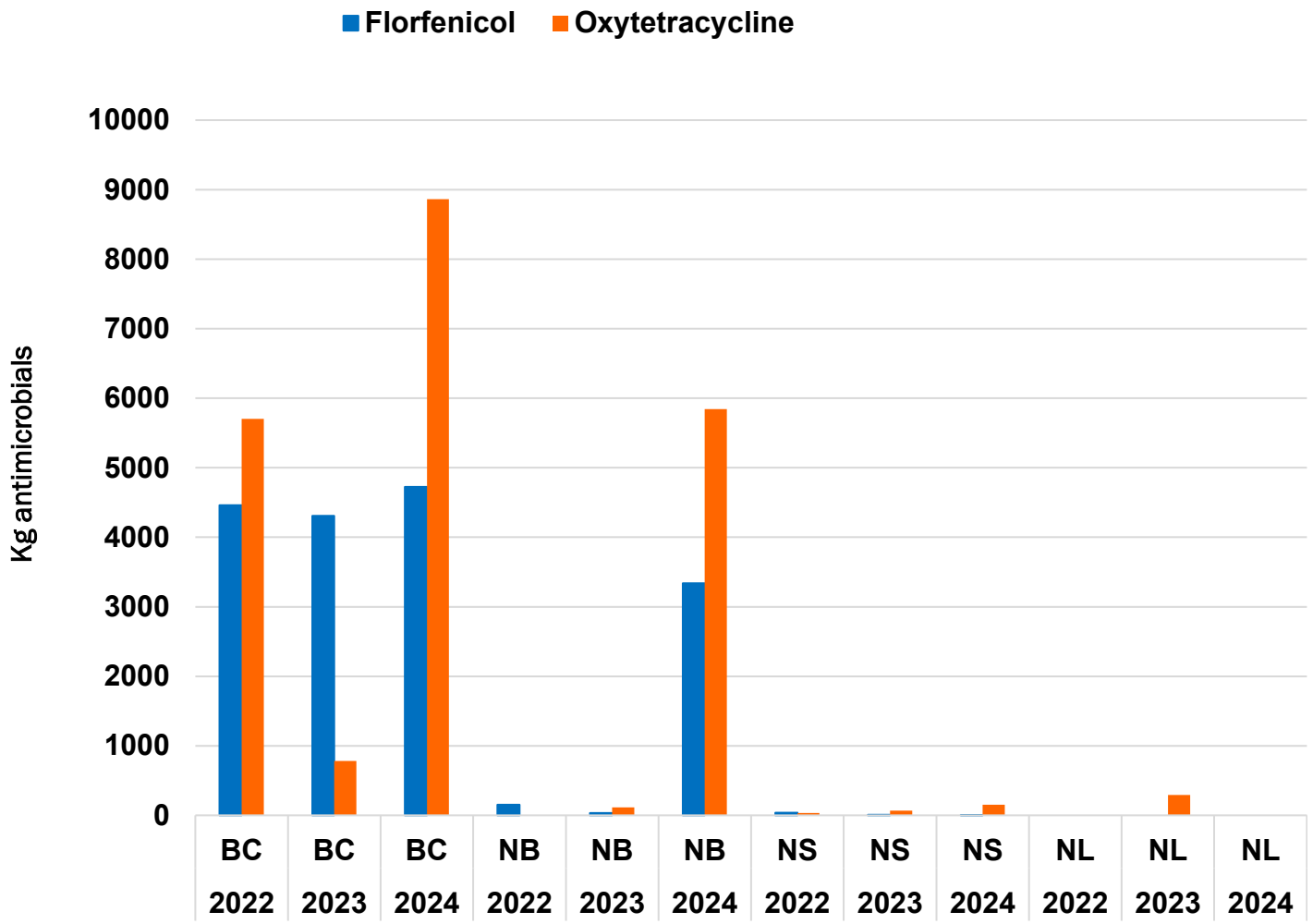
Prescribed florfenicol and oxytetracycline increases remained evident after biomass adjustment (AMU-DFO)



DFO prescription data
https://open.canada.ca/data/en/dataset/288b6dc4-16dc-43cc-80a4-2a45b1f93383

Kg of antimicrobials prescribed over time in aquaculture (AMU-DFO)

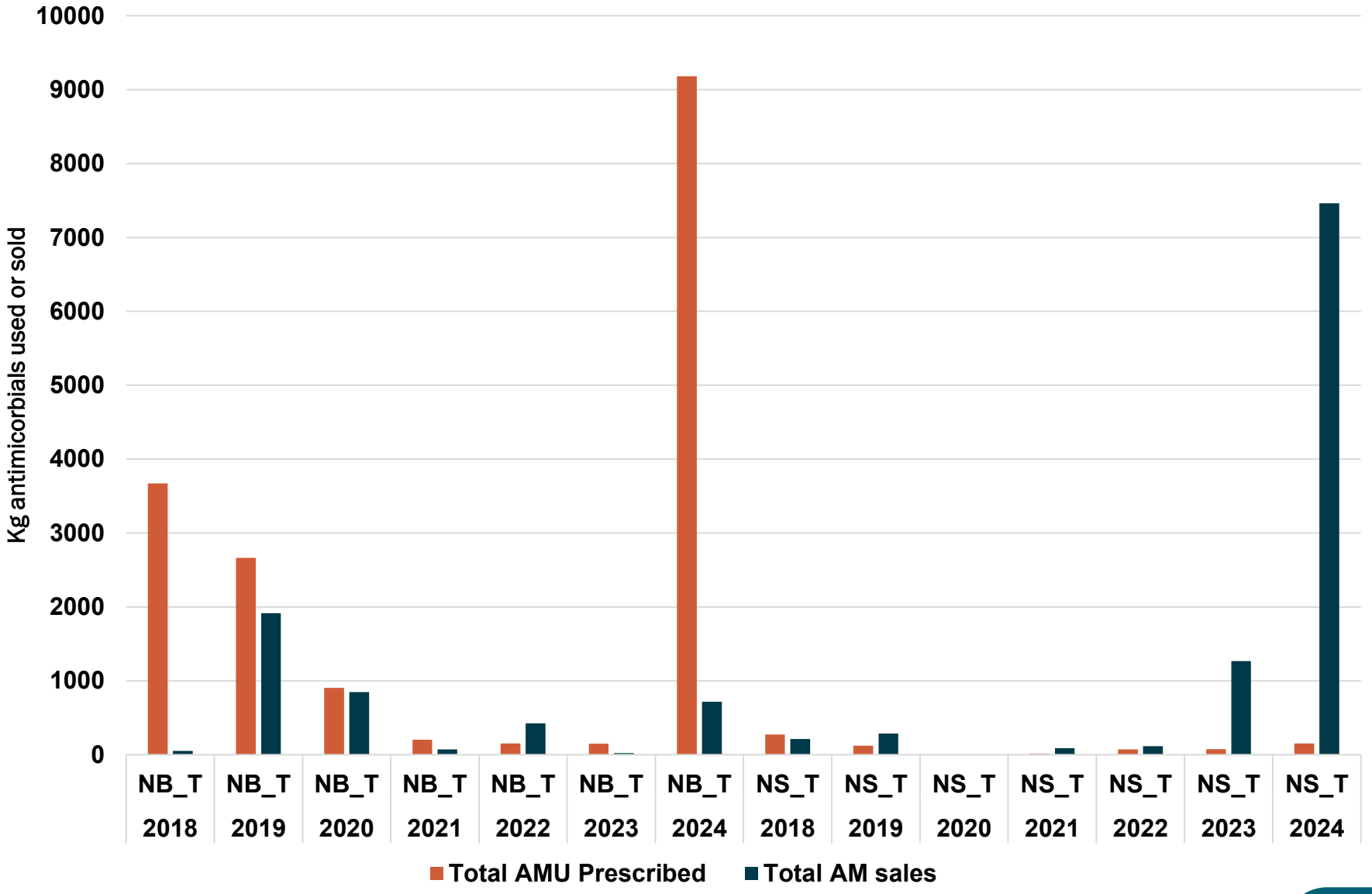
- The increase observed in 2024 was driven primarily by British Columbia and New Brunswick
- Oxytetracycline was a major contributor to the increase
- Florfenicol remained a major component of prescribed antimicrobial use during the surveillance period, particularly in British Columbia



DFO prescription data
https://open.canada.ca/data/en/dataset/288b6dc4-16dc-43cc-80a4-2a45b1f93383

Comparing prescribed AMU (DFO) and antimicrobial sales (VASR) in aquaculture: New Brunswick and Nova Scotia

- DFO prescription data and VASR antimicrobial sales data are shown in parallel
- National antimicrobial sales generally provide a reasonable proxy for AMU
- Regional feed manufacturing and distribution can affect where sales are recorded
- Consequently, prescription data may better reflect where antimicrobials are intended to be used, particularly at the regional level



CIPARS-VASR (Public Health Agency of Canada and Health Canada)
DFO prescription data
https://open.canada.ca/data/en/dataset/288b6dc4-16dc-43cc-80a4-2a45b1f93383

Key messages

- Antimicrobial use increased substantially in Canadian aquaculture in 2024
- Most of the increase was observed in British Columbia and New Brunswick
- Oxytetracycline accounted for most of the increase in antimicrobial use
- Preliminary antimicrobial sales data indicate that use declined in 2025
- Surveillance data show **where, when, and how much** antimicrobial use changed, but additional disease, production, and environmental data are needed to explain **why**

Thank you! Questions?

- CIPARS is interested in collaborations to support the generation, sharing, and interpretation of AMR data in Canadian aquaculture