

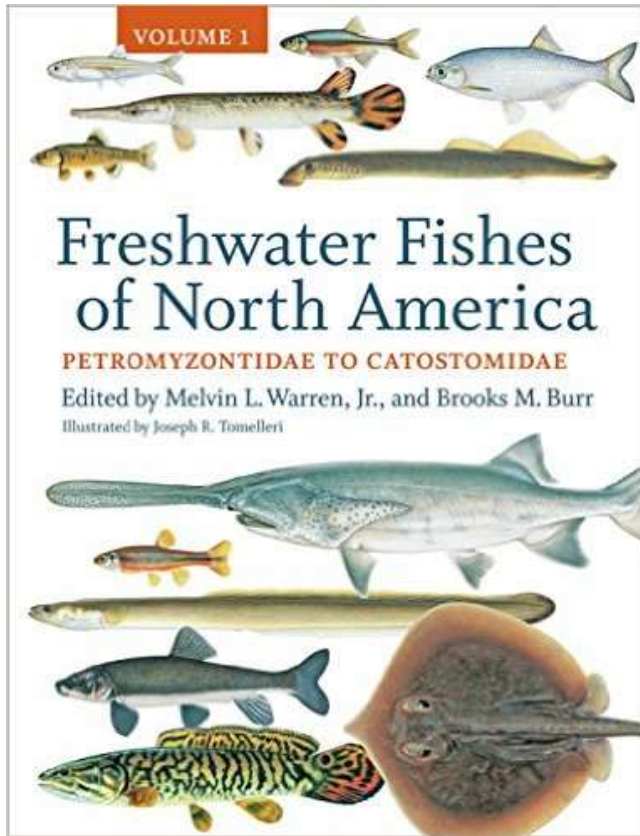
Past, Present, and Future Freshwater Fish Introductions in Canada

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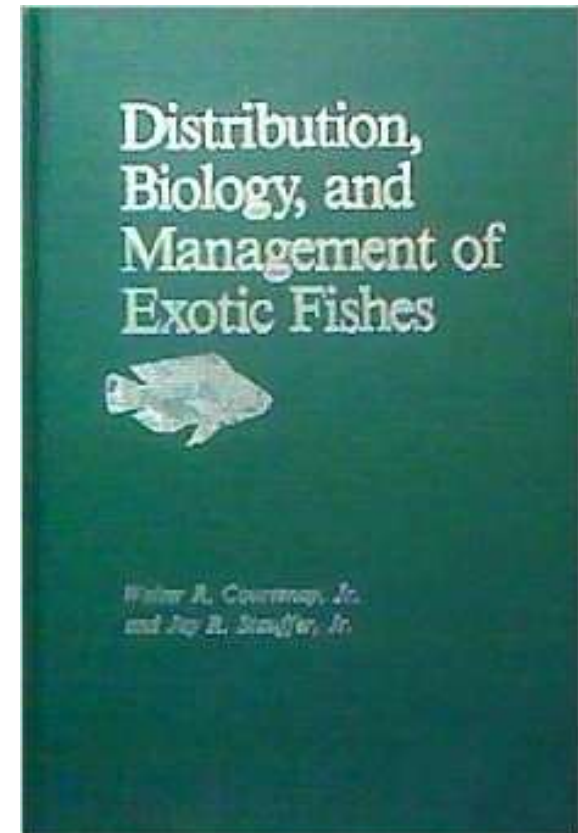


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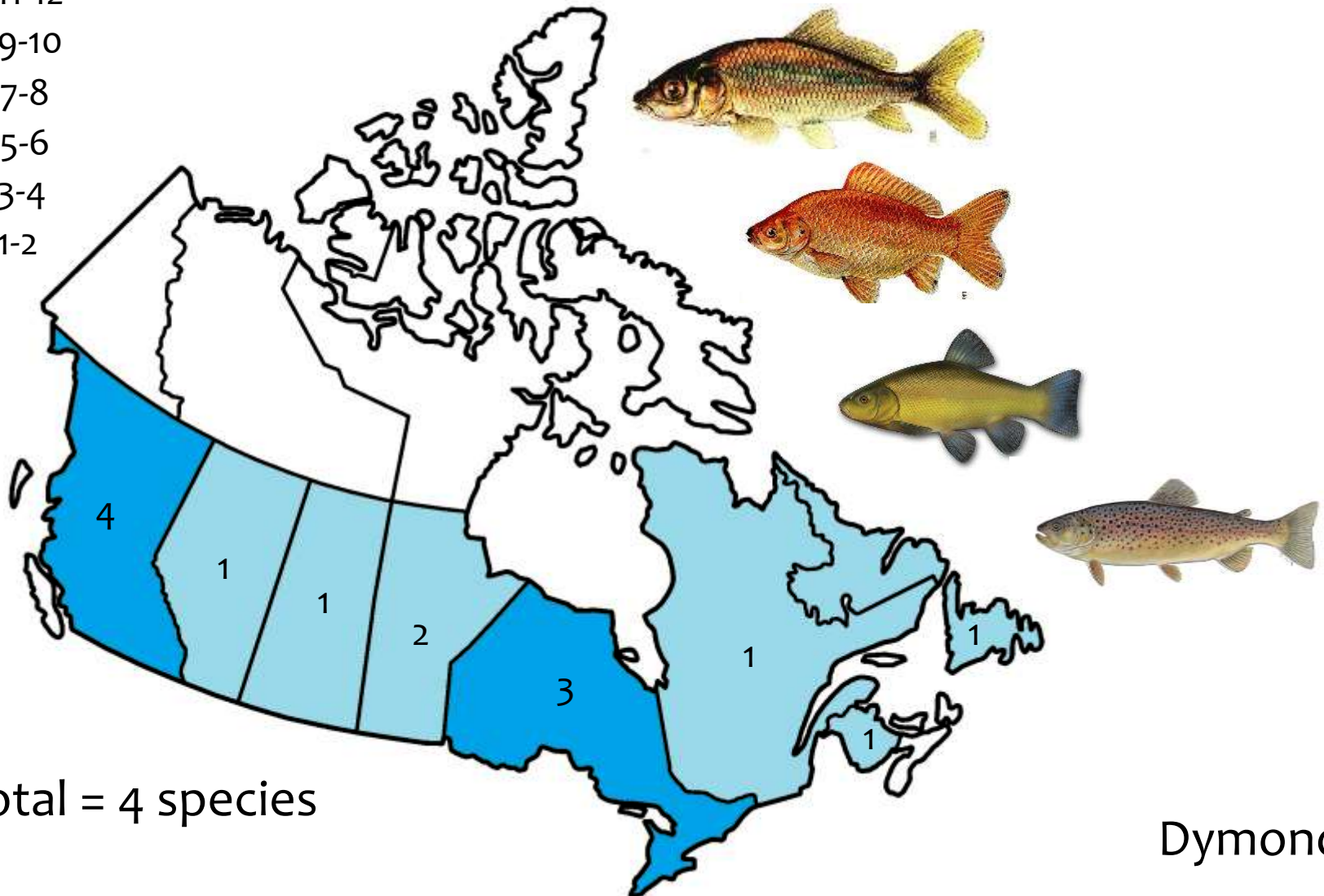
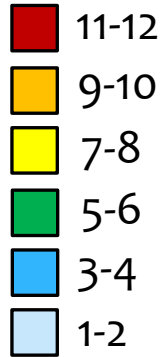
Freshwater fisheries in
Canada: historical and
contemporary
perspectives on the
resources and their
management

American Fisheries
Society



Past-Present-Future

No. of Species

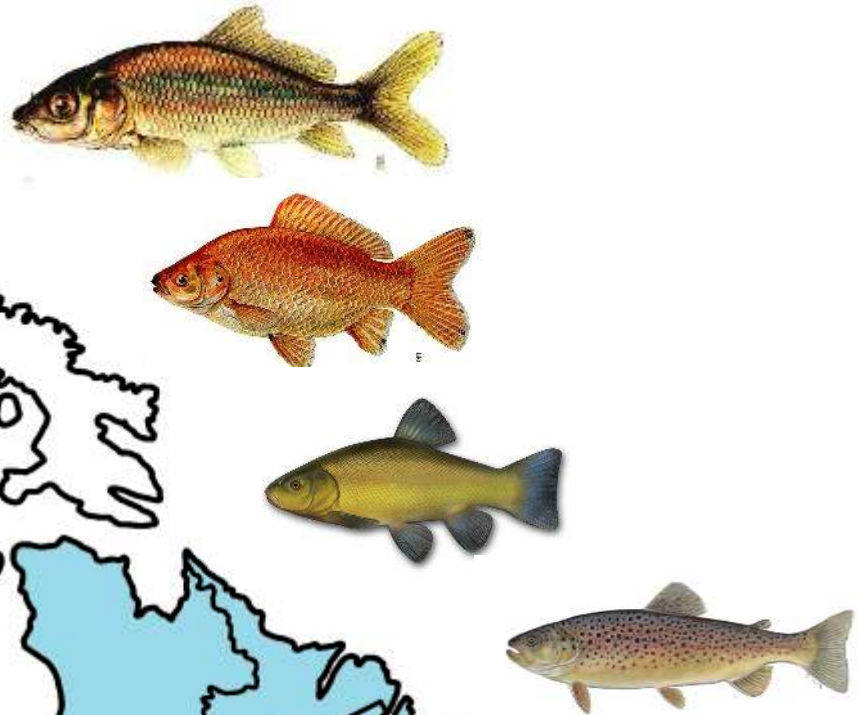
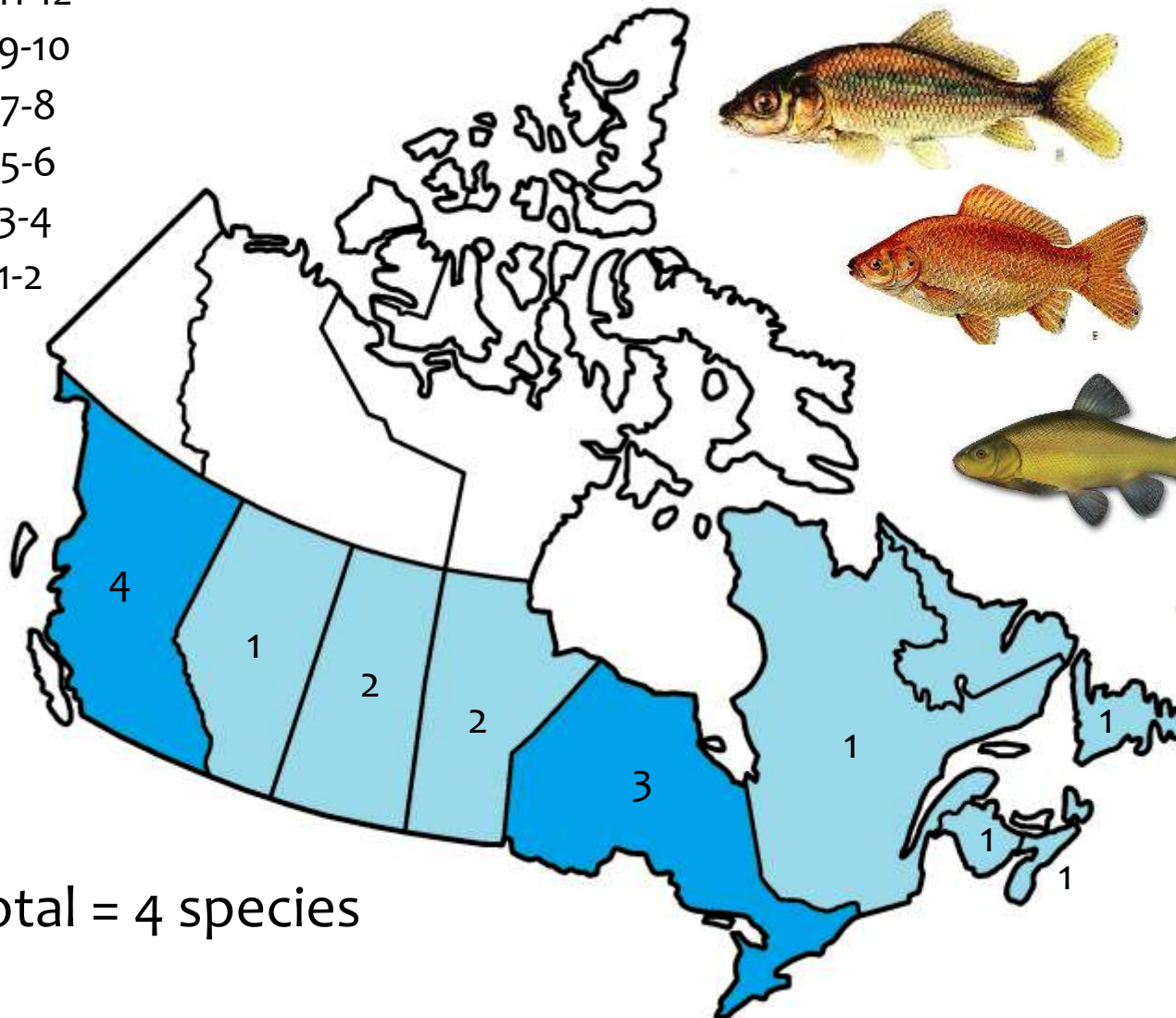
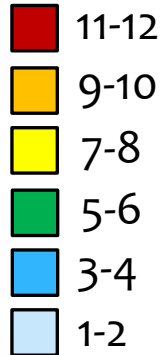


Total = 4 species

Dymond 1955

Past-Present-Future

No. of Species

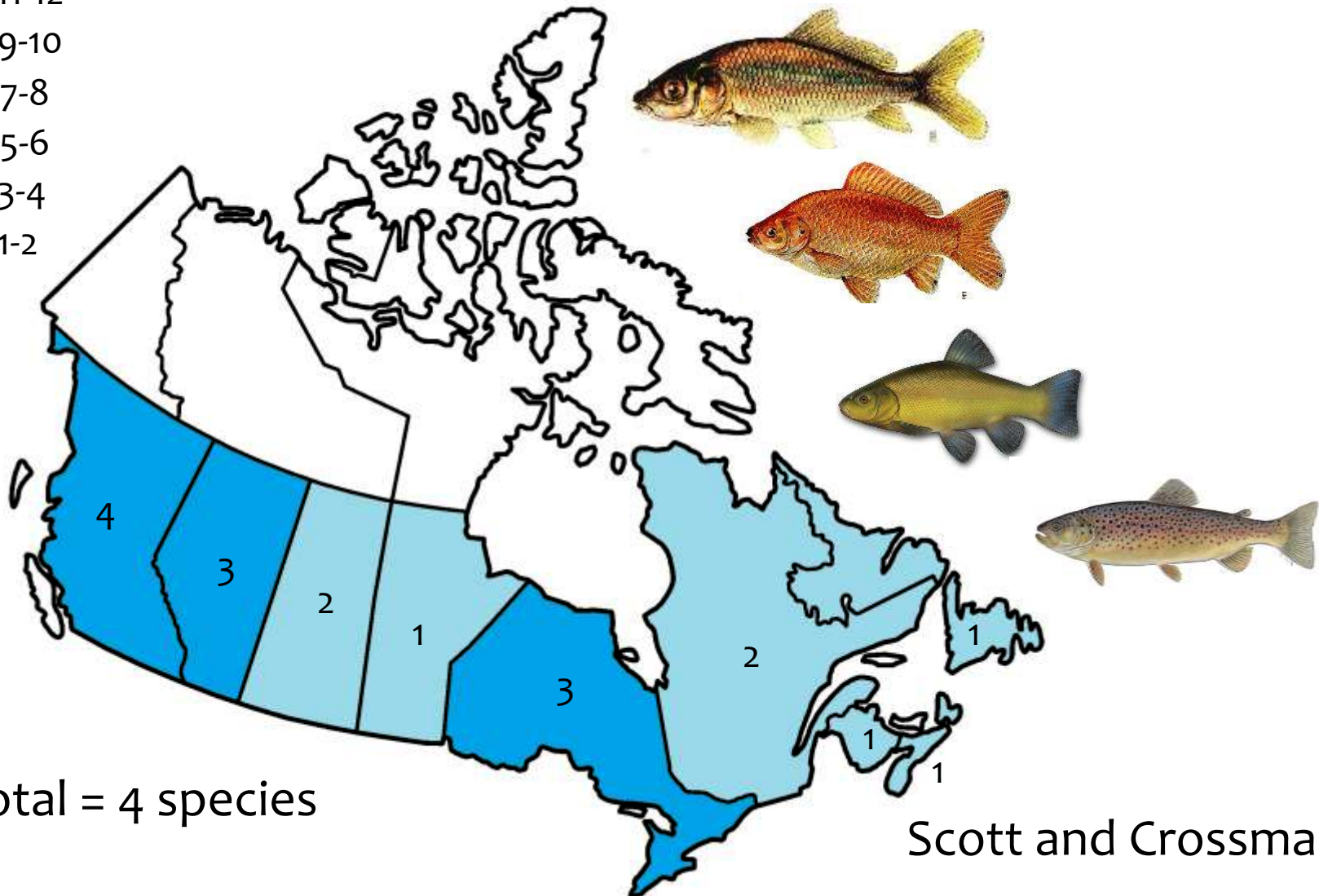
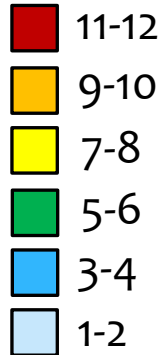


Total = 4 species

Scott 1958

Past-Present-Future

No. of Species

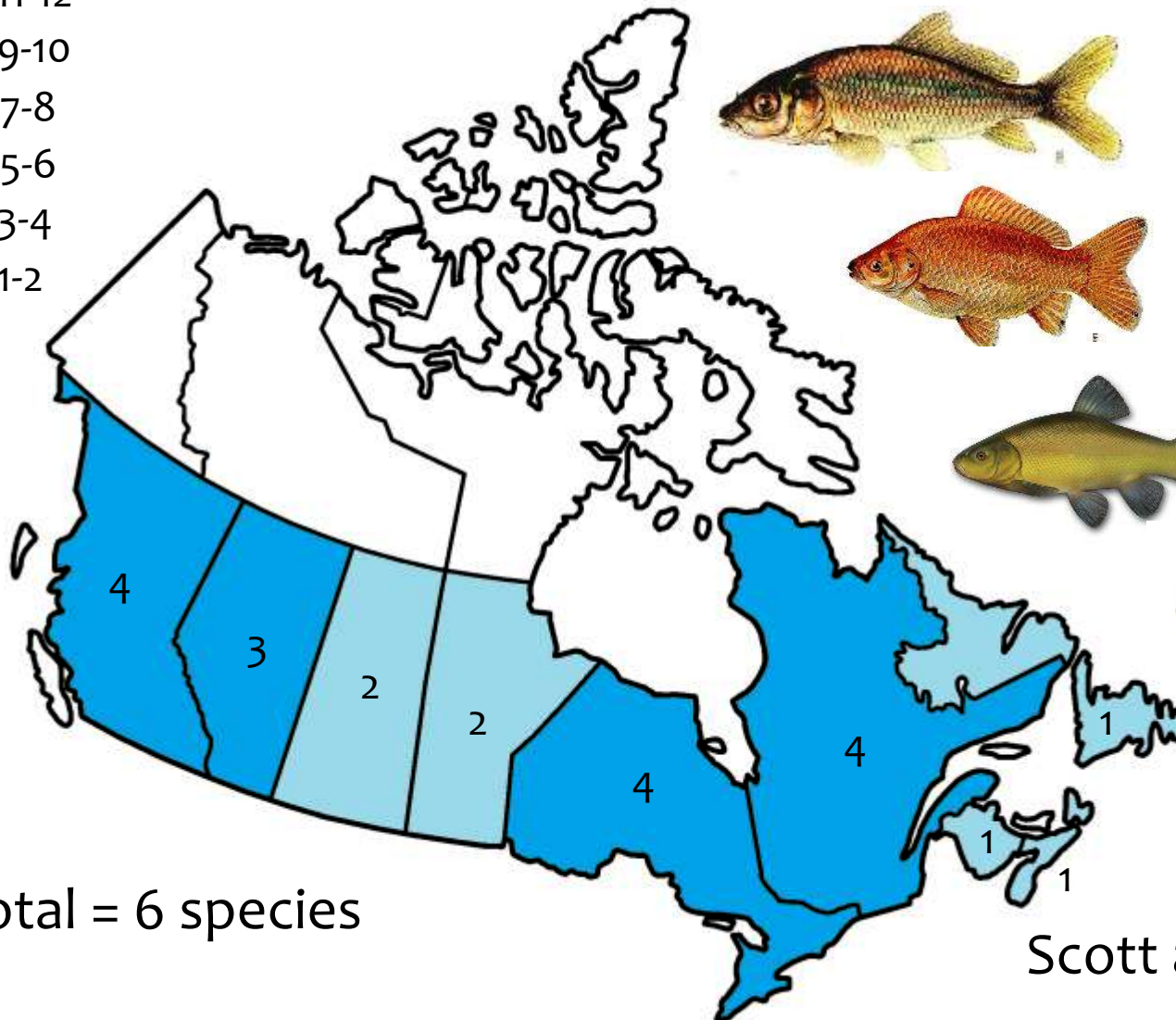
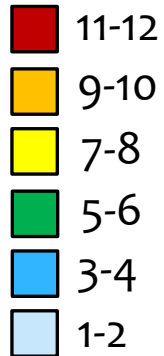


Total = 4 species

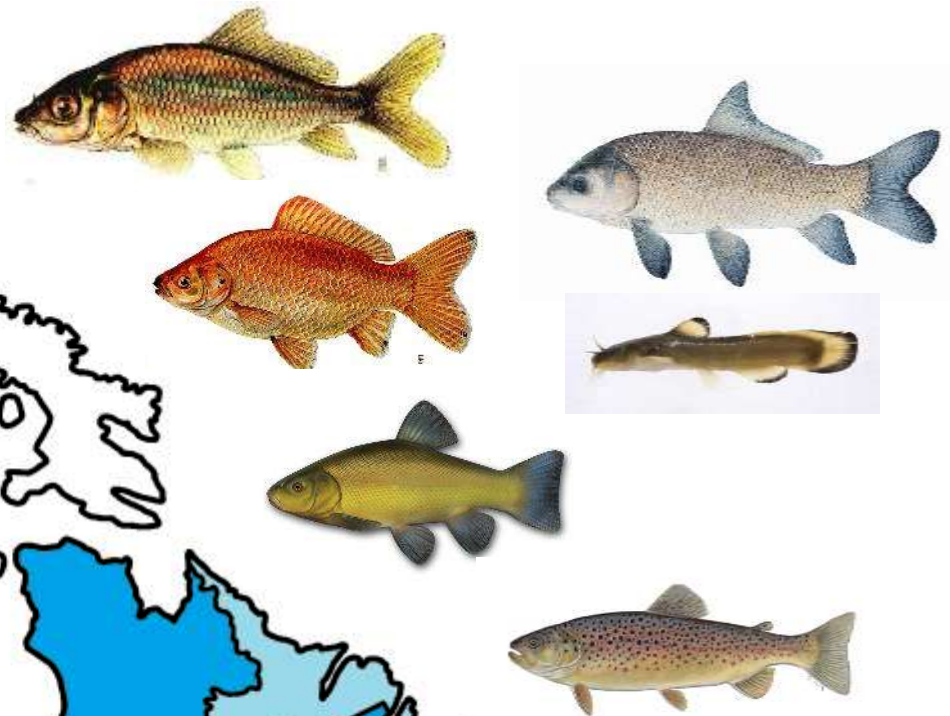
Scott and Crossman 1973

Past-Present-Future

No. of Species



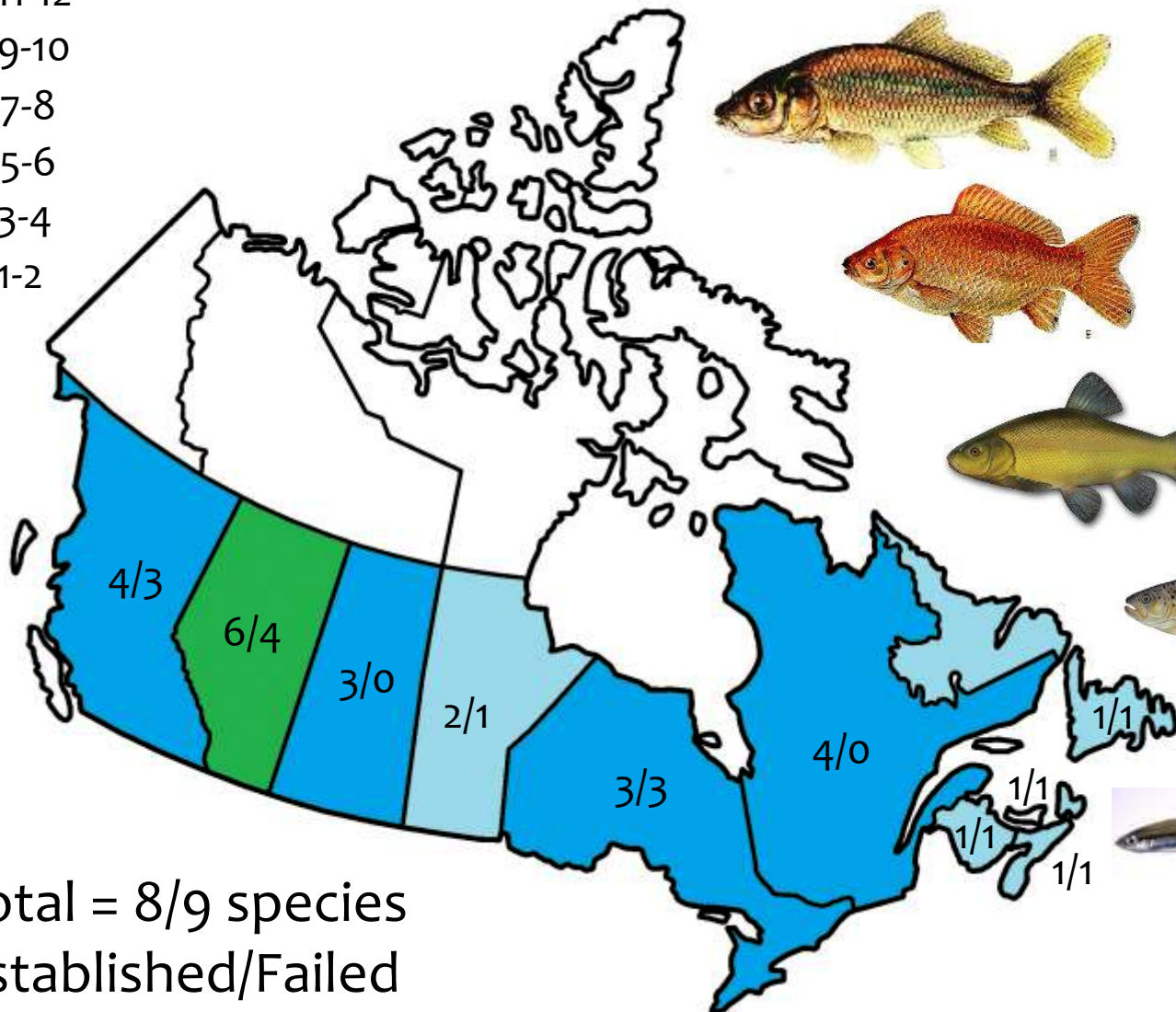
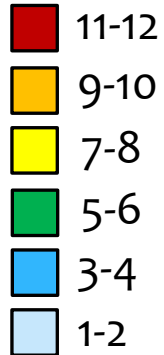
Total = 6 species



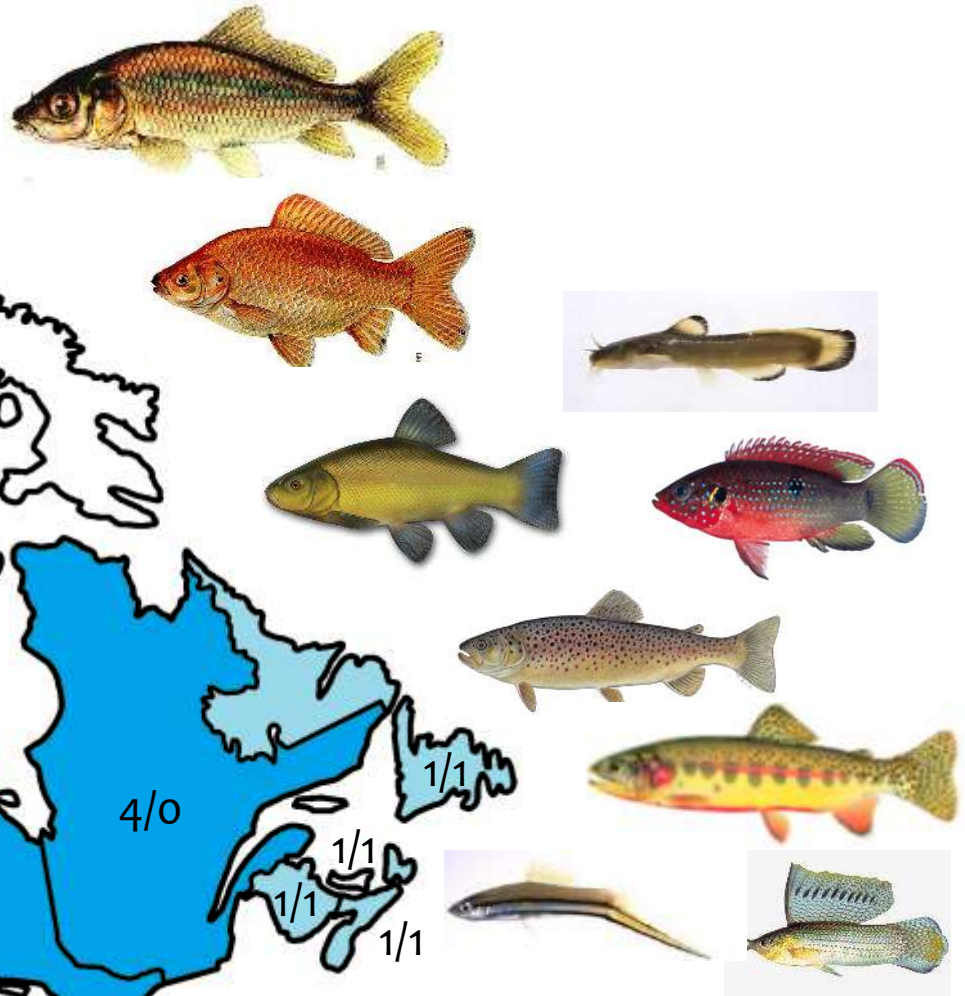
Scott and Crossman 1979

Past-Present-Future

No. of Species



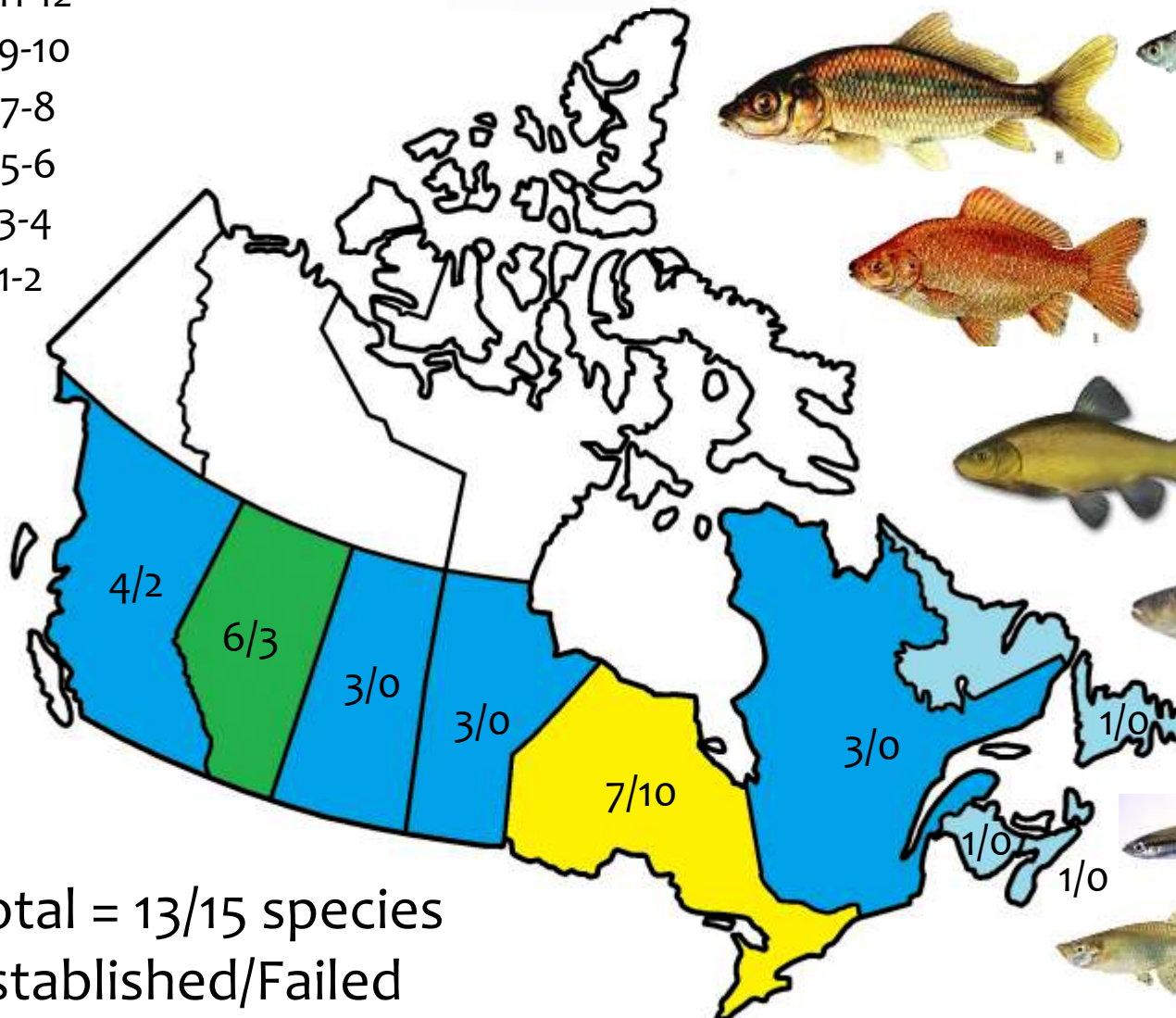
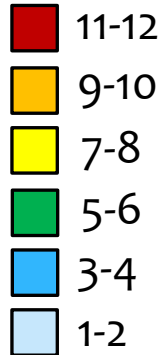
Total = 8/9 species
Established/Failed



Crossman 1984

Past-Present-Future

No. of Species



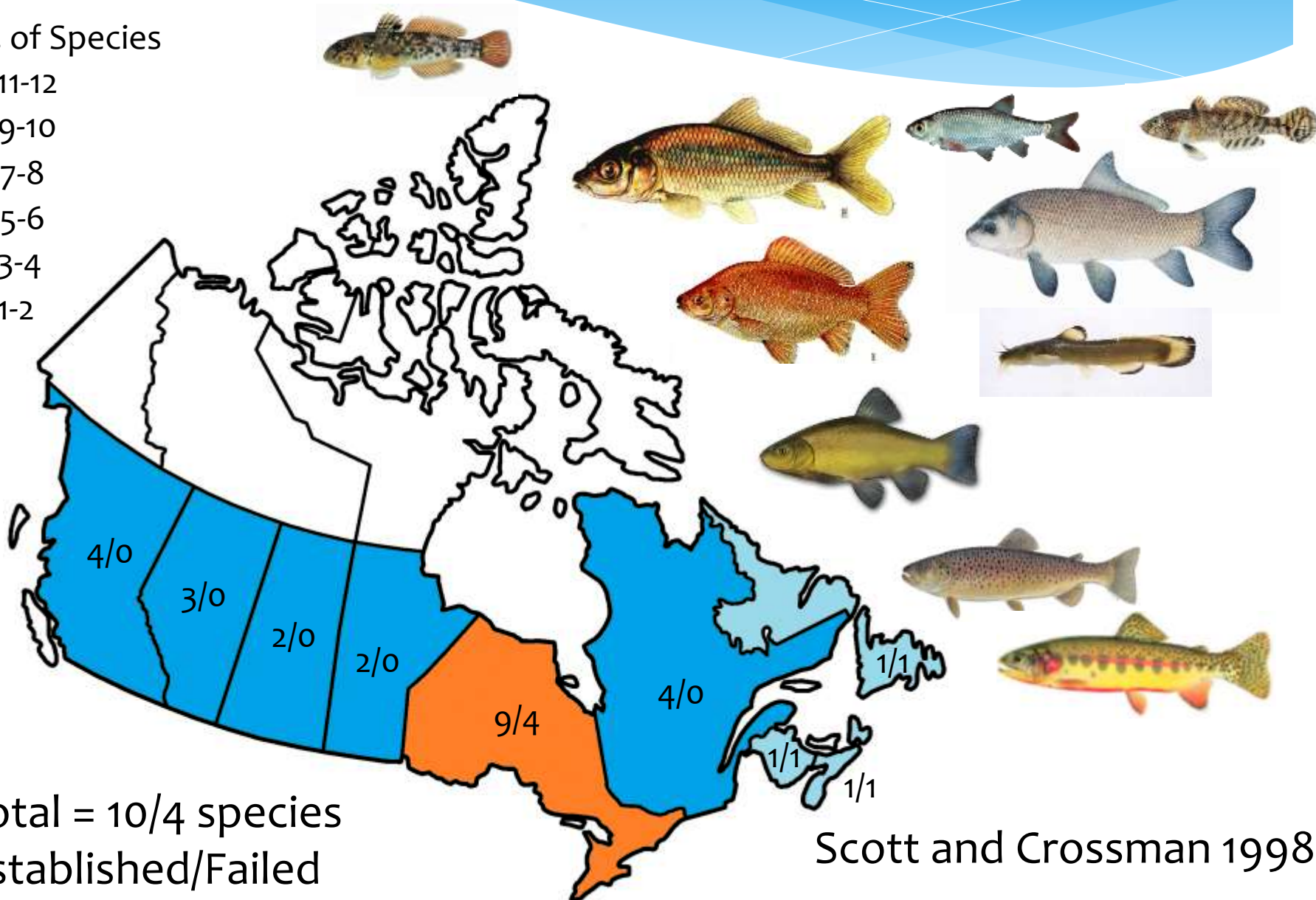
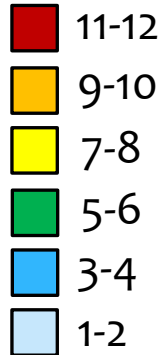
Total = 13/15 species
Established/Failed



Crossman 1991

Past-Present-Future

No. of Species

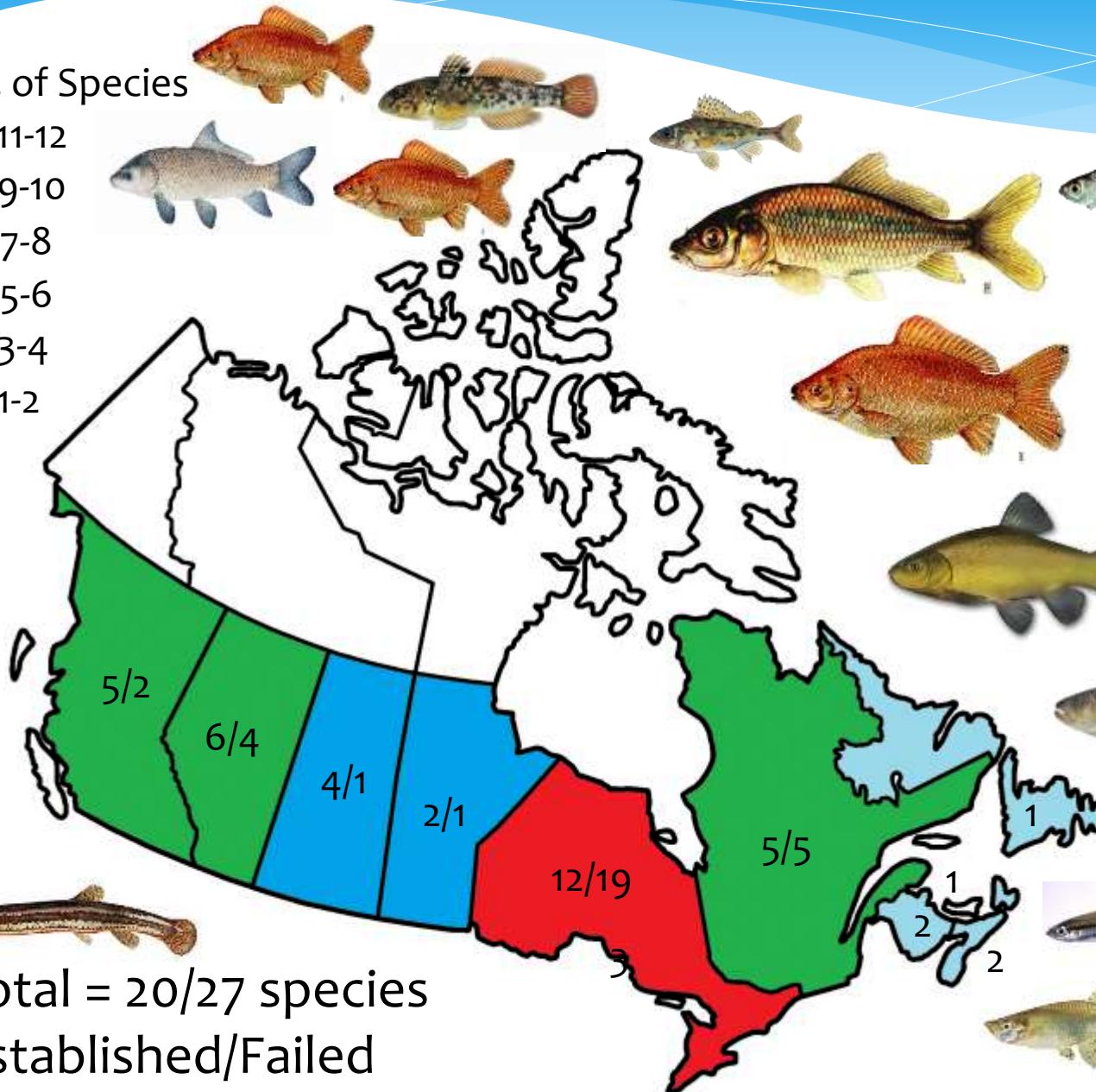
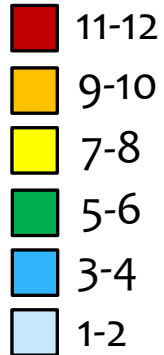


Total = 10/4 species
Established/Failed

Scott and Crossman 1998

Past-Present-Future

No. of Species



Total = 20/27 species
Established/Failed

Current Study

Past-Present-Future

Failed Invaders



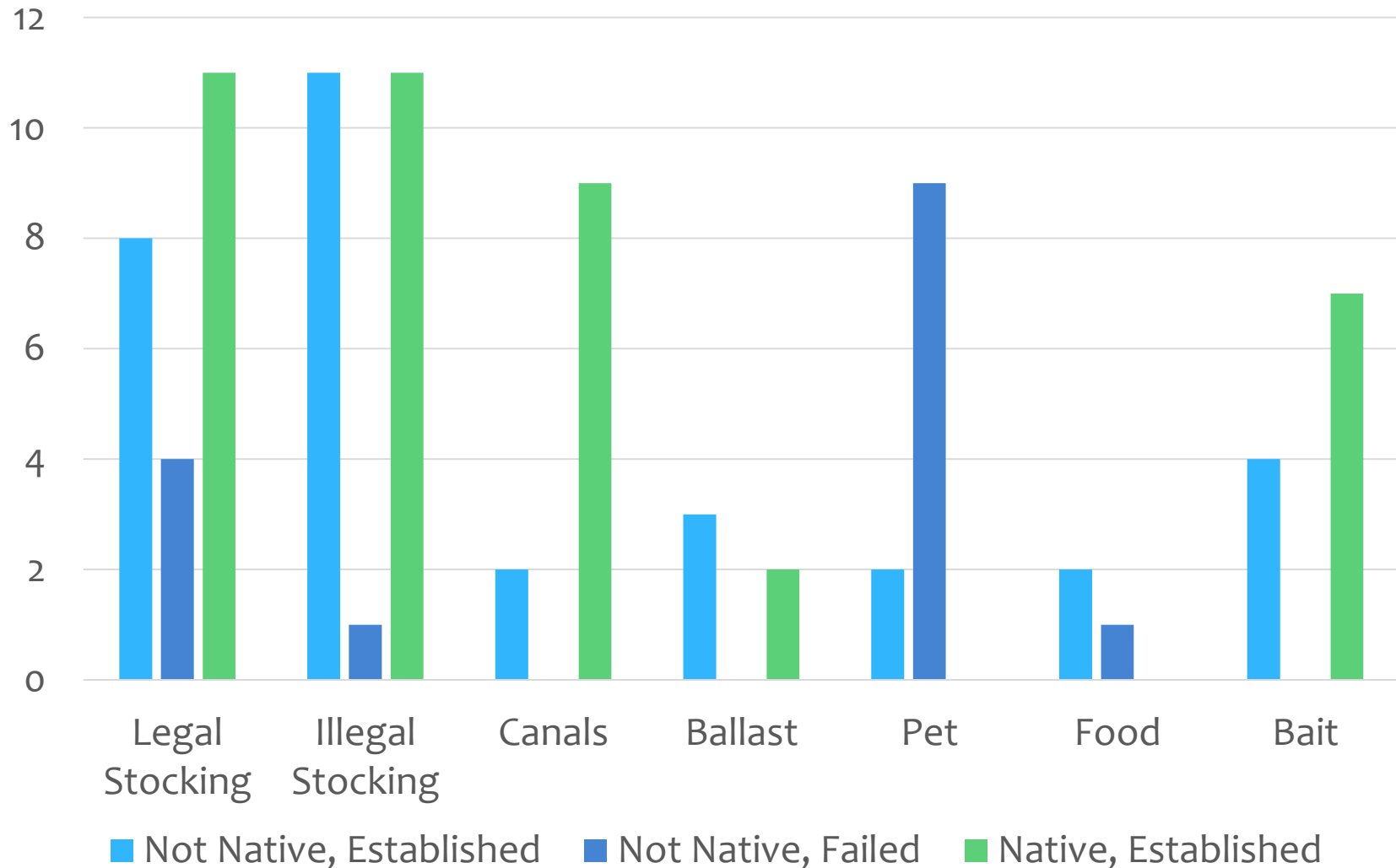
**You can't
make this
stuff up**

■ Brampton lake closed after piranha caught



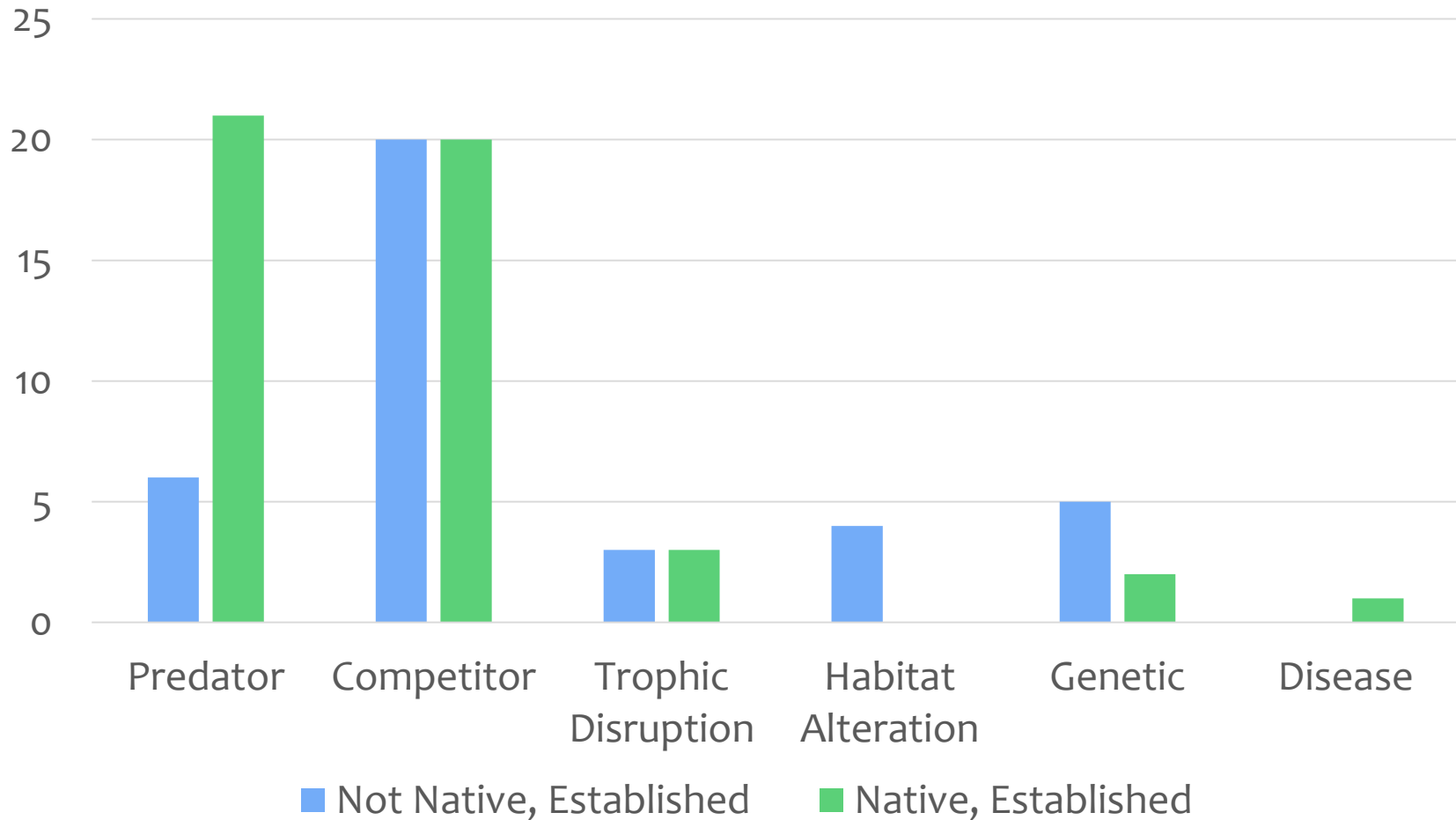
Past-Present-Future

Pathways



Past-Present-Future

Impacts



NO NEW MISSISSIPPI FISH SPECIES DETECTED SINCE ELECTRICAL BARRIER (2004)

Invasion Stage	Method	Cross-validate	No. Spp.
Establishment	DFA	73%	27/58

Past-Present-Future

- Based on ecological traits, predicted potential establishment, spread, and impact of 110 Ponto-Caspian fish species in the Great Lakes, if transported by ballast water

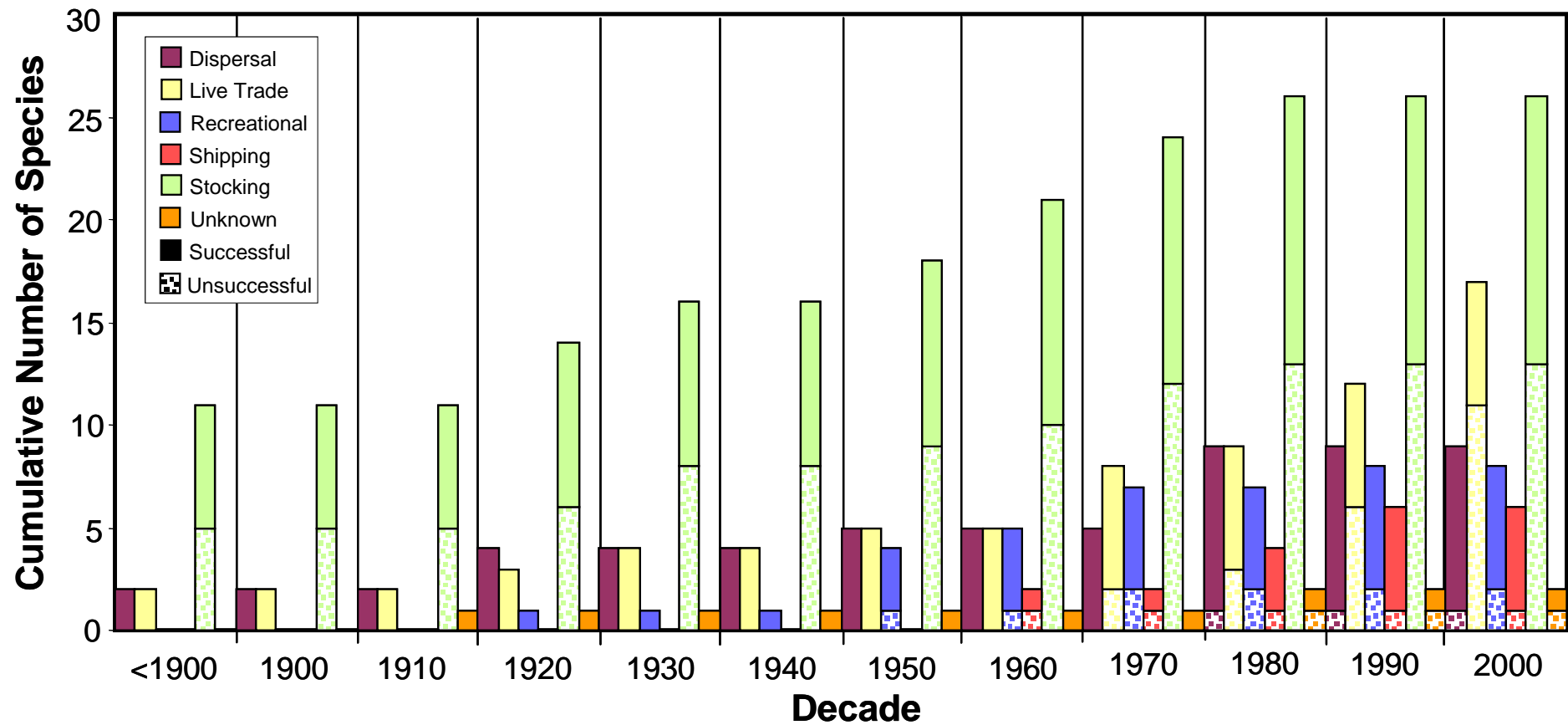
Invasion Stage	Method	Cross-validate	No. Spp.
Establishment	DFA	83%	24/66
	CART	82%	36/66
Fast Spread	DFA	90%	18/24
Nuisance (Impact)	DFA	80%	6/24

NO NEW PONTO-CASPIAN FISH SPECIES DETECTED SINCE GOBIES (1980S)

Invasion Stage	Method	Cross-validate	No. Spp.
Establishment	DFA	79%	28/42
Spread	DFA	81%	9/28
Impact	DFA	73%	5/9

Past-Present-Future

Great Lakes Pathways



Mandrak and Cudmore 2010

Past-Present-Future

- Based on ecological traits, risk assessment of potential establishment and impact of 825 freshwater fish species in trade (aquarium, water garden, food) in Canada.

Invasion Stage	Method	Cross-validate	No. Spp.
Climate Match	FISK	n/a	30/825
Impact	FISK	n/a	12/30



Mandrak et al. 2013

Past-Present-Future

- Based on ecological traits, predicted potential establishment, spread, and impact of 825 freshwater fish species in trade (aquarium, water garden, food) in Great Lakes.

Invasion Stage	Method	Cross-validate	No. Spp.
Establishment	CART	78%	38/65
Impact	CART	79%	12/38



Howeth et al. 2015

Past-Present-Future



Silver Carp (*Hypophthalmichthys molitrix*)



Grass Carp (*Ctenopharyngodon idella*)



Bighead Carp (*H. nobilis*)



Black Carp (*Mylopharyngodon piceus*)

Questions?