

COSEWIC &
Insect Biodiversity
Surveys. L. Packer
& C. Sheffield



Arthropods Subcommittee Members





COSEWIC members





TALK OUTLINE

COSEWIC – History, Structure and Function Risk Assessment and Guidelines

- Guidelines – X, XT, SC, NAR, DD
- Criteria – E & T

Process

Risk Categories, Criteria and Guidelines

- Definitions – many, many, many
- A, B, C, D, E

Examples

Conclusions regarding insect survey inputs to COSEWIC

Threats and the A3 criterion (time permitting)



COSEWIC

History

- ❑ Established in 1977
- ❑ First assessments in 1978
- ❑ Legally recognized under *SARA* in 2003.

Primary functions

- Independent advice based on the best available information based on scientific knowledge, community knowledge and aboriginal traditional knowledge (ATK).
- Advice is irrespective of socioeconomic and political consequences.
- Advice is communicated to the public at the same time that it is communicated to government

Membership



■ **Composed of 31 voting members (mostly paired, i.e. two representatives of each group may be present, but only one will cast a vote at any one time)**

- Four members from Federal Departments: CWS, DFO, Parks, FBIP
- Thirteen members from provincial and territorial governments
- Three non-government members
- Ten co-chairs of the Species Specialists Subcommittees (SSCs): plants, mosses, freshwater fish, marine fish, herps, birds, terrestrial mammals, marine mammals, arthropods, molluscs
- One co-chair of the Aboriginal Traditional Subcommittee (ATK SC)

Process



- Potentially listable species suggested to/by SSC
- SSC prioritizes list and brings it to COSEWIC
- COSEWIC ranks list and a certain # are put forward for bids (# depends on \$\$ available)
- Bids evaluated, report commissioned
- Report received by SSC co-chair and reviewed numerous times by various groups of people
- SSC suggests assessment criteria
- COSEWIC votes on status (SSC co-chair receives straw ballots prior to – or at the - meeting)
- Status is assigned based upon 2/3 majority vote – achieving this can take a very long time sometimes

COSEWIC

Risk Categories

Are based upon IUCN framework





COSEWIC Risk Categories

Extinct

A wildlife species that no longer exists.

Extirpated

A wildlife species that no longer exists in the wild in Canada, but exists elsewhere

Endangered

A wildlife species facing imminent extirpation or extinction

Threatened

A wildlife species likely to become endangered if limiting factors are not reversed



COSEWIC Risk Categories

Special Concern

A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

Not at Risk

A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.

Data Deficient

A category that applies when the available information is insufficient a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.

COSEWIC Assessments: Criteria and Guidelines



Only the threatened and endangered categories are based on **quantitative criteria**

Assessment Criteria - definitions

Need to understand definitions before using criteria
There are 11 pages of definitions in the O & P manual

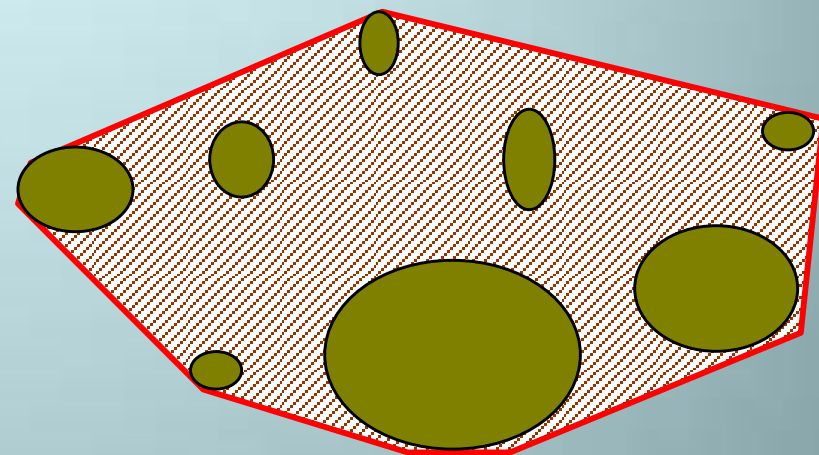
Indicator	Endangered	Threatened
B. Small Distribution Range and Decline or Fluctuation		
B1. Extent of occurrence estimated to be	< 5,000 km ²	< 20,000 km ²
or		
B2. Index of area of occupancy estimated to be	< 500 km ²	< 2,000 km ²
and (for either B1 or B2) estimates indicating at least two of a-c:		
a. Severely fragmented or known to exist at:	≤ 5 locations	≤ 10 locations
b. Continuing decline, observed, inferred or projected , in any of (i) extent of occurrence , (ii) index of area of occupancy , (iii) area, extent and/or quality of habitat, (iv) number of locations or populations , (v) number of mature individuals .		
c. Extreme fluctuations in any of (i) extent of occurrence, (ii) index of area of occupancy , (iii) number of locations or populations, (iv) number of mature individuals.		
C. Small and Declining Number of Mature Individuals		
C. Total number of mature individuals estimated to be:	<2,500	< 10,000



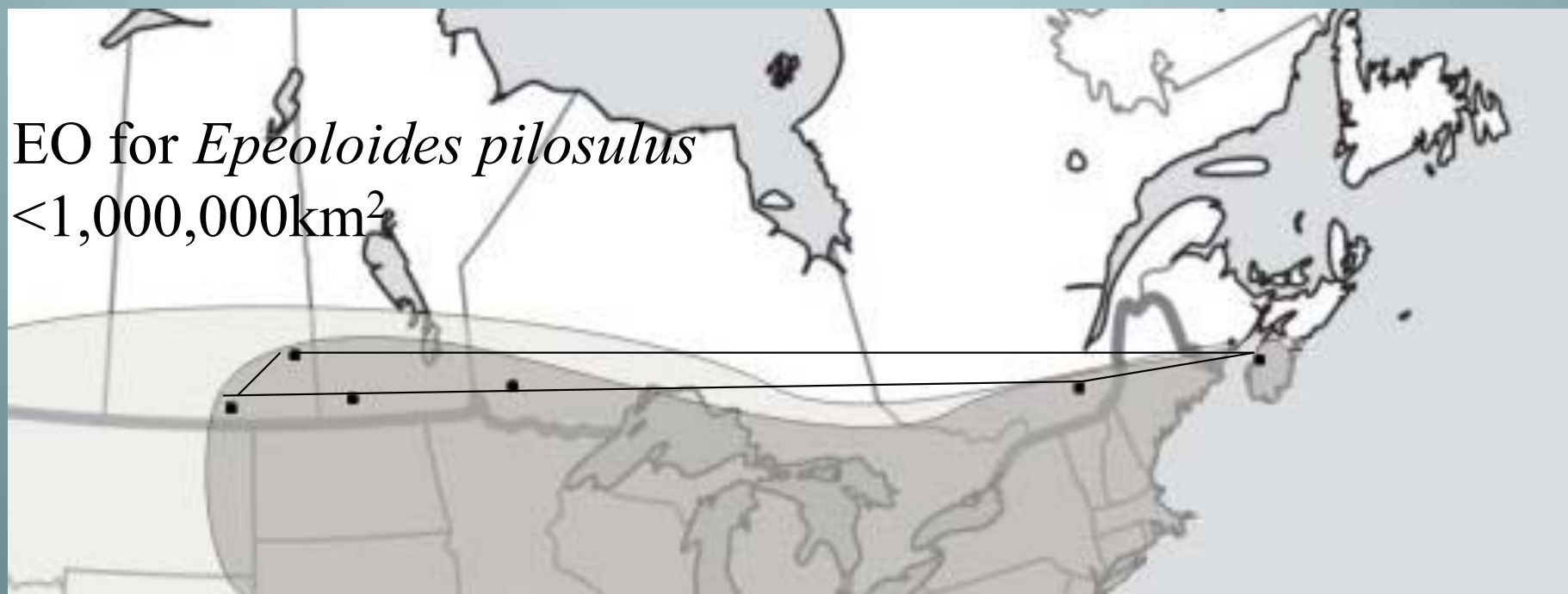
Assessment Criteria - definitions

Extent of Occurrence (EO)

Extent of Occurrence is the area included in a polygon without concave angles that encompasses the geographic distribution of all known populations of a wildlife species.



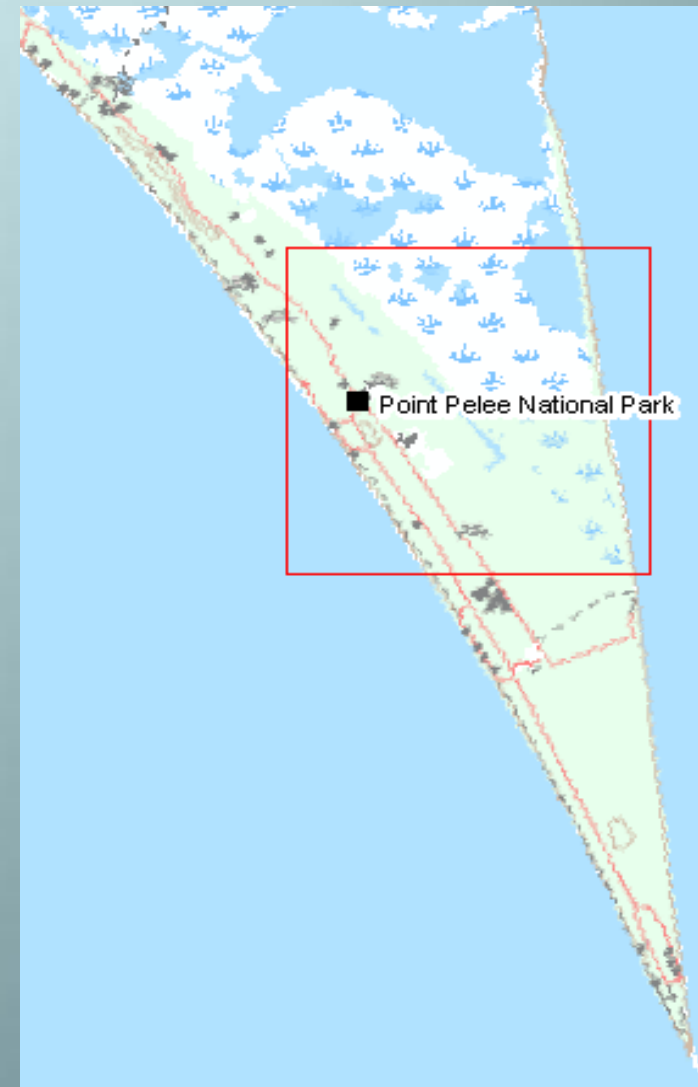
EO for *Epeoloides pilosulus*
<1,000,000km²



Assessment Criteria - definitions

Index of Area of Occupancy (IAO)

- An standardized estimate of area occupied by a wildlife species that is consistent across taxonomic groups and against COSEWIC's assessment criteria.
- Measured as the area of grid cells that intersect the actual area occupied by the wildlife species.
- COSEWIC requires that IAO be calculated based on a grid with a cell size of 2 km x 2 km.
- In specific circumstances, a grid with a cell size of 1 km x 1 km can be used. However, IAO based on a 2x2 grid must also be calculated and reported.

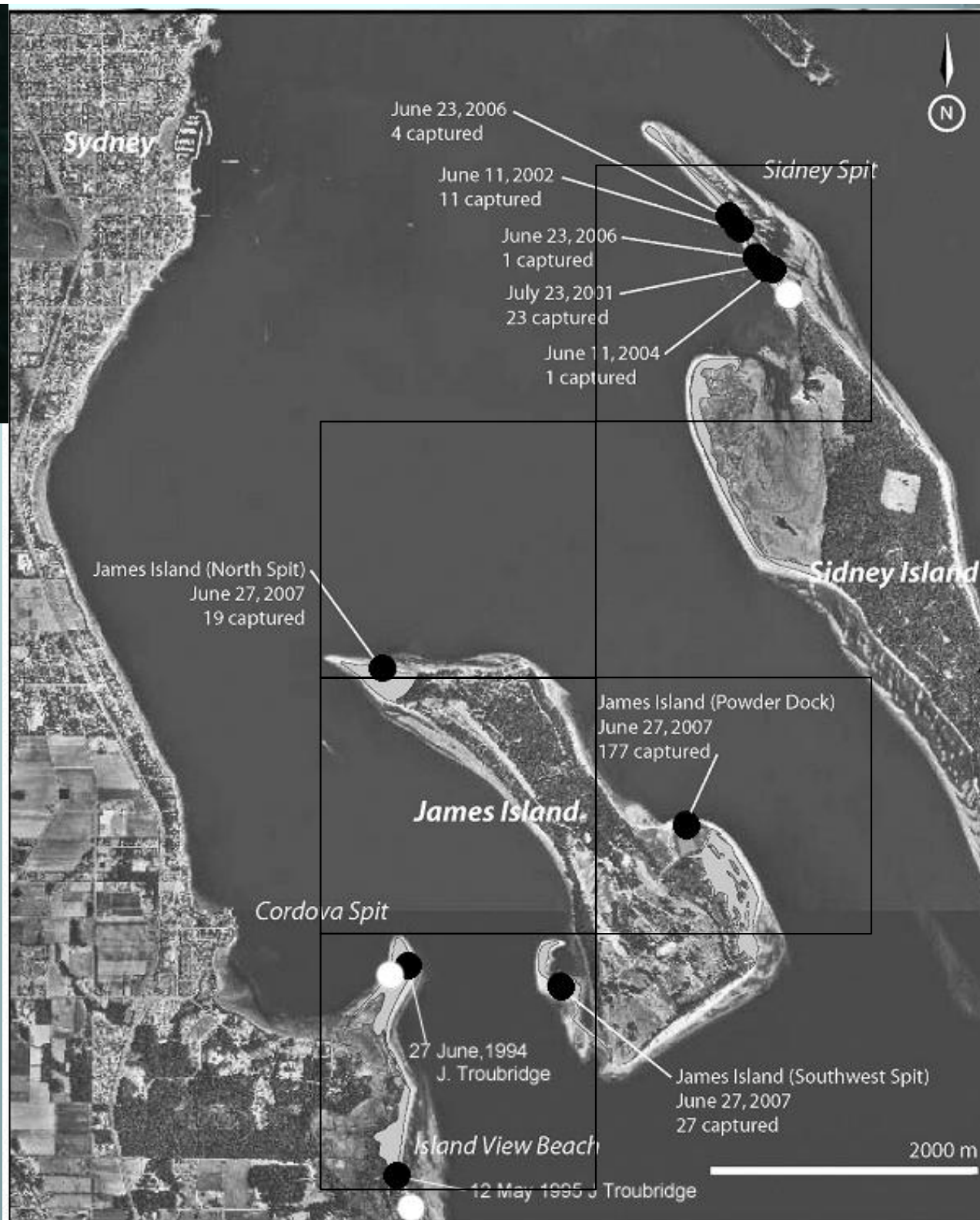




IAO for *Anarta edwardsii*

4 2x2 squares

IAO = 16km²



Index of Area of Occupancy

IAO in Canada is most of the southern part of the country

IAO in Mexico is at most 120km²

IAO in California is ~1600km²

Actual area occupied in Mexico is <1km²

Meets B2 for threatened but not the subcriteria - # locations too high

Listed as special concern

Danaus plexippus





Assessment Criteria - definitions

Location

Location is a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon.

Size of the location depends on the area covered by the threatening event and **may include one or more populations.**

Rapidly encroaching invasive competitor or predator as the main threat – likely one location

Cottage development around a lake for a lakeshore tiger beetle – number of locations equals the number of cottages predicted, if the entire area has potential as a subdivision then it could be one location

Maritime Ringlet – 3 Locations

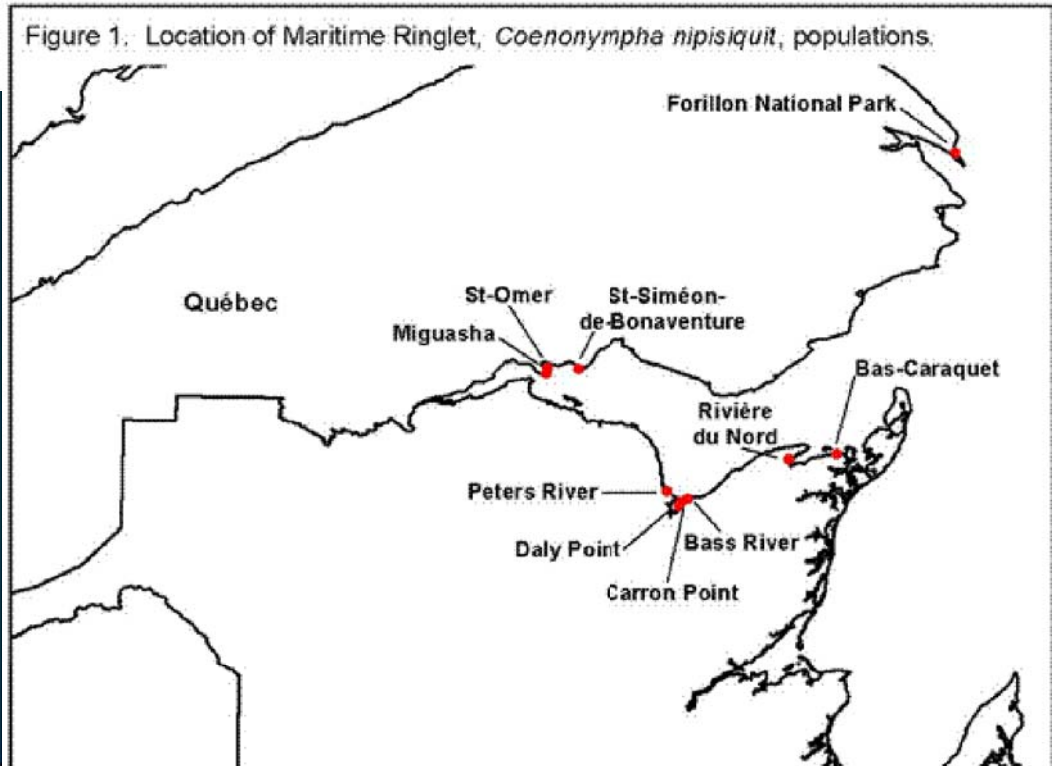
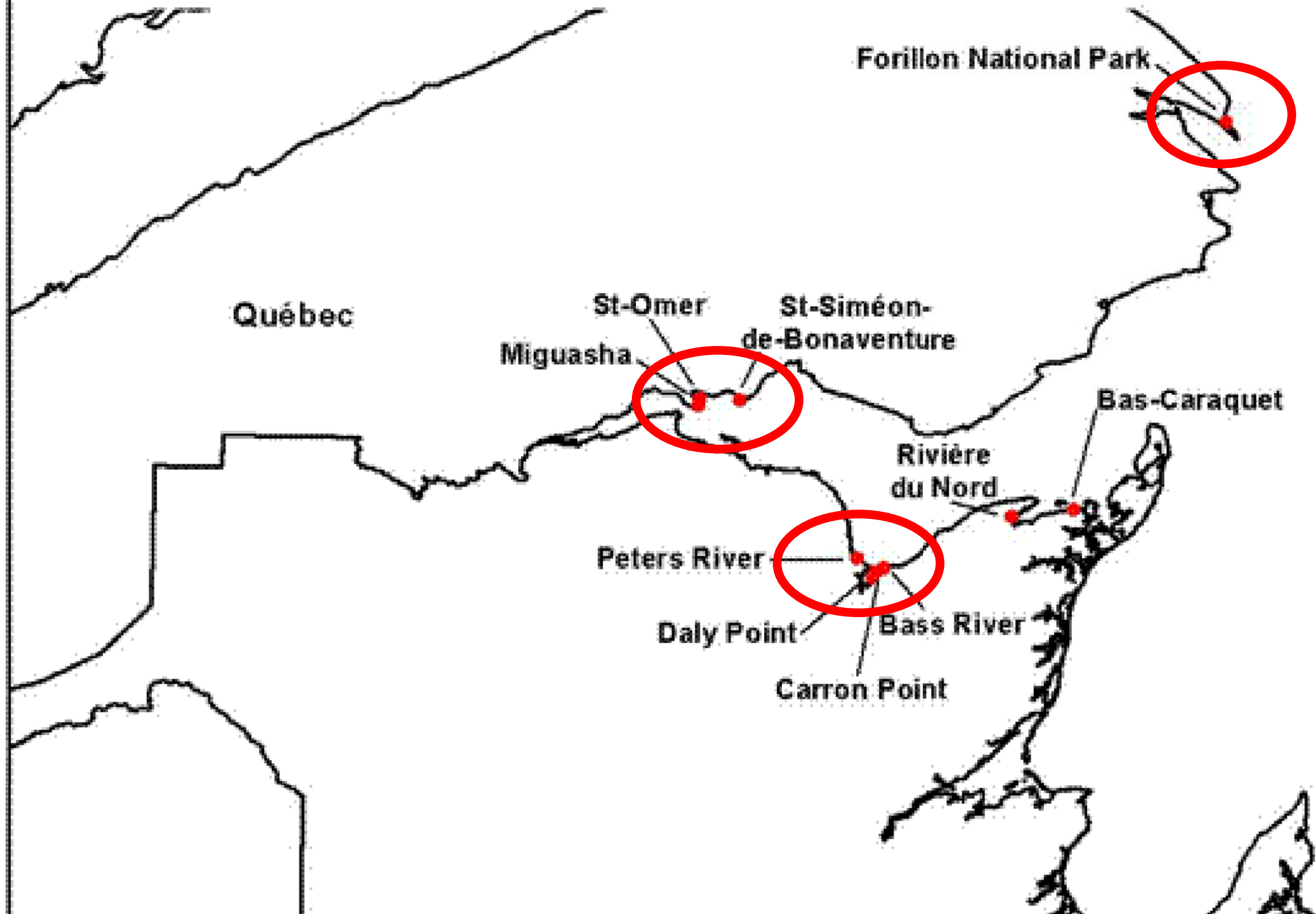


Figure 1. Location of Maritime Ringlet, *Coenonympha nipisiquit*, populations.





Assessment: Criteria

- The COSEWIC Assessment Criteria only applies to the Threatened and Endangered categories.

A

Population decline

B

Small distribution & decline or fluctuation

C

Small population size & decline

D

Very small or restricted population

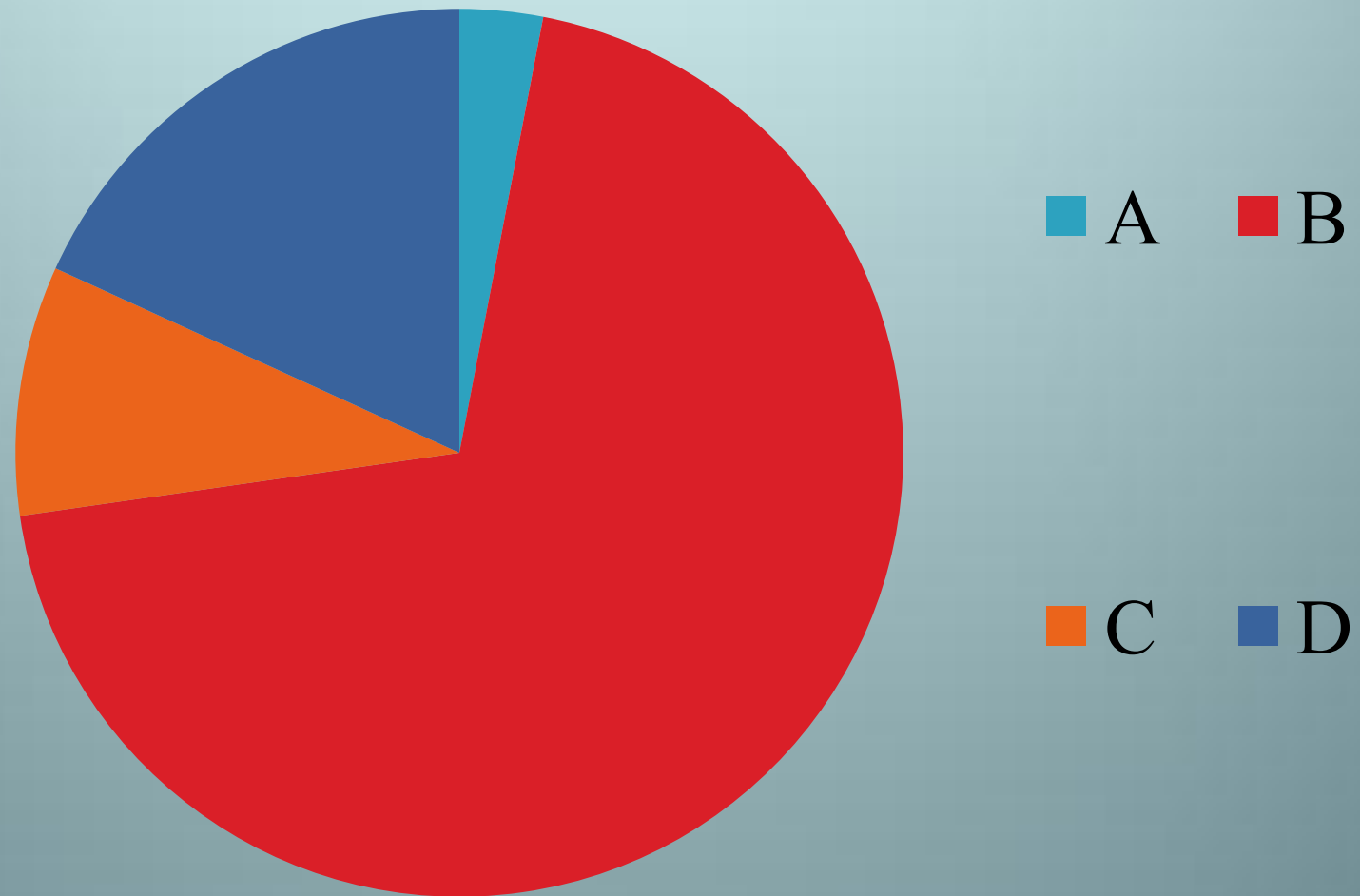
E

Quantitative analysis

Numerical
Thresholds and
Discussion

Status

Assessment Criteria used by Arthropod SSC, n=36

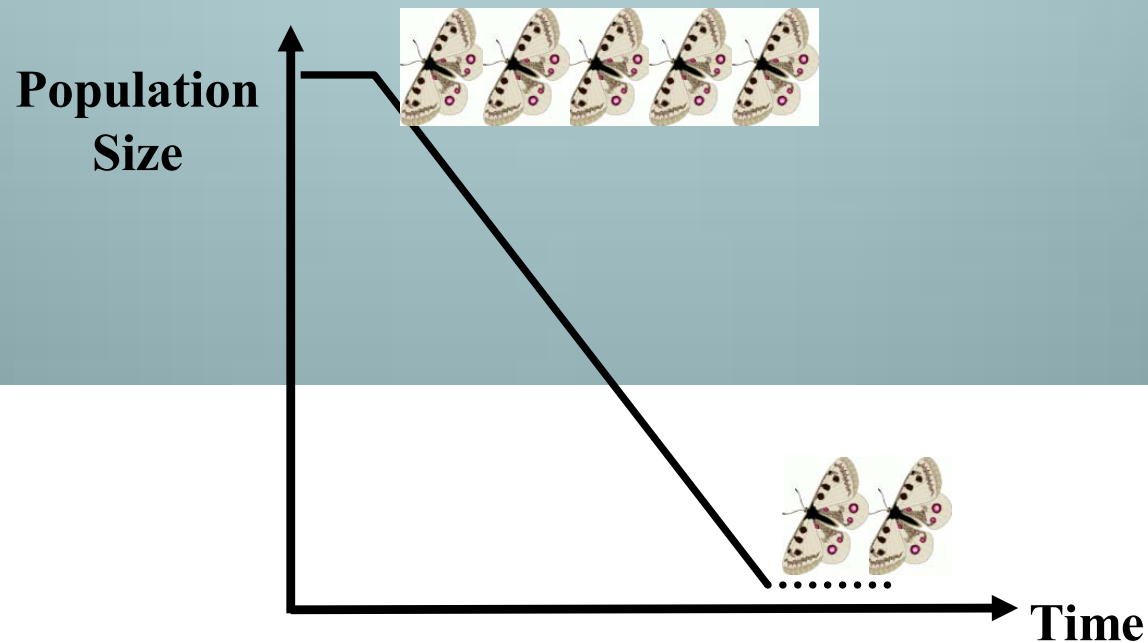




Assessment Criteria

Criterion A:

**Decline in number of mature individuals
(used once by Arthropods SSC, but this will increase)**



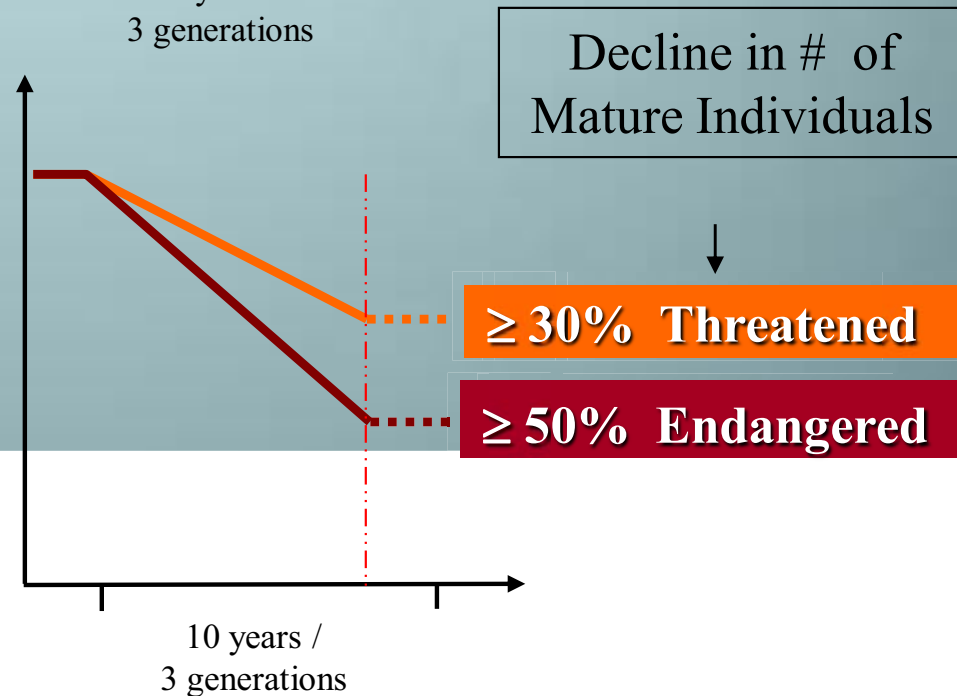
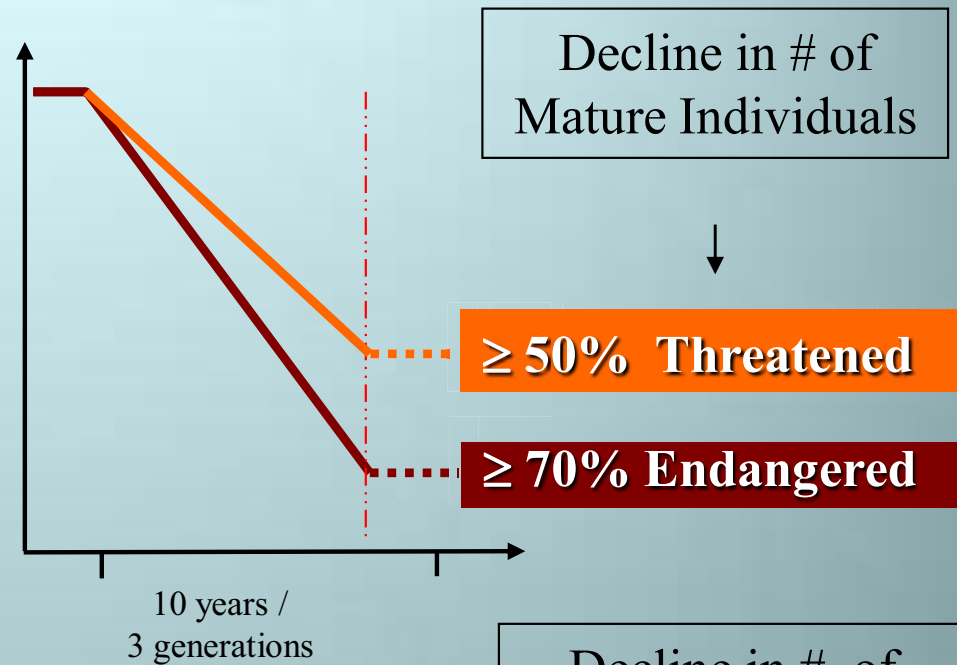
Criterion A

Sub-criterion A1

Observed, estimated, inferred or suspected **decline in the past** (10 years or 3 generations, whichever is longer), where causes **are** understood **and** have ceased **and** decline is reversible.

Sub-criterion A2

Observed, estimated, inferred or suspected **decline in the past** (10 years or 3 generations, whichever is longer), where causes **may not be** understood **or** may not have ceased **or** decline may not be reversible.



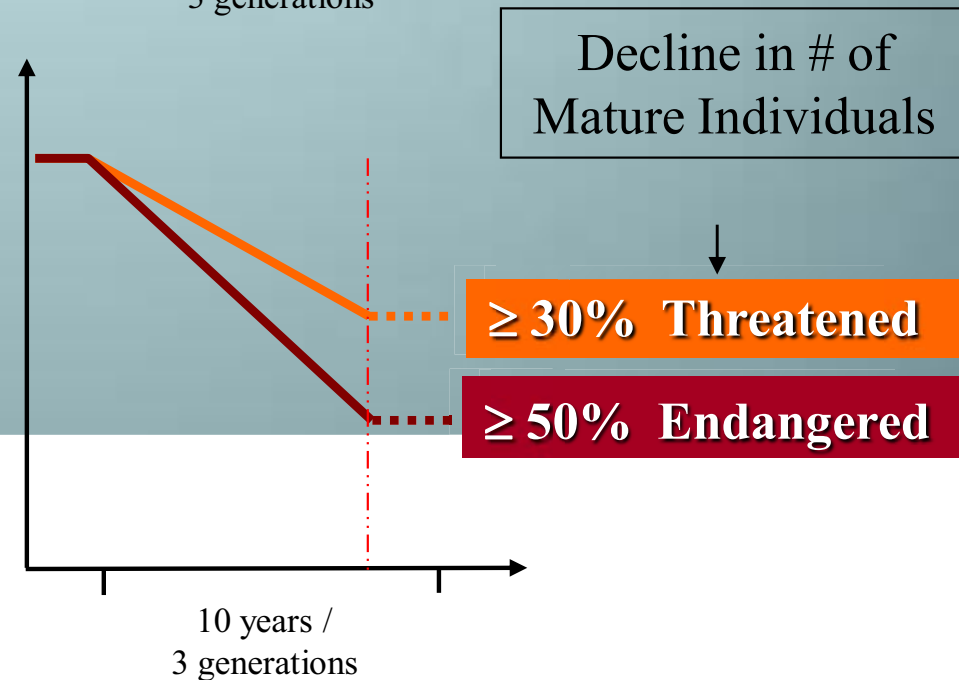
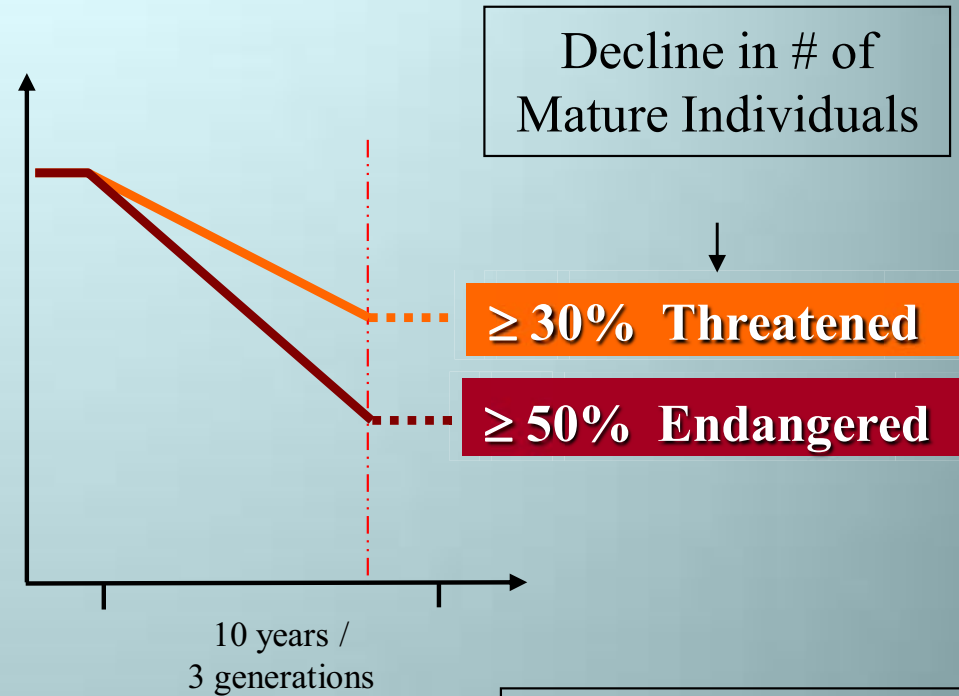
Criterion A

Sub-criterion A3

Projected or suspected **decline in the future** (10 years or 3 generations, whichever is longer).
Increased use of A3 expected.

Sub-criterion A4

Observed, estimated, inferred, projected or suspected **decline**, where the time period (10 years or 3 generations, whichever is longer) **includes some time in the past and in the future**, and where declines or causes **may not** have ceased **or** may not be understood **or** may not be reversible.





Criterion A

EXAMPLE:

Rusty-patched Bumble Bee

Bombus affinis

Status: Endangered

Criteria: A2ce + B12ab i ii iv v

Rationale: SSC did not recommend application of A criteria

(recommended B criteria) but

COSEWIC decided to add the A criteria

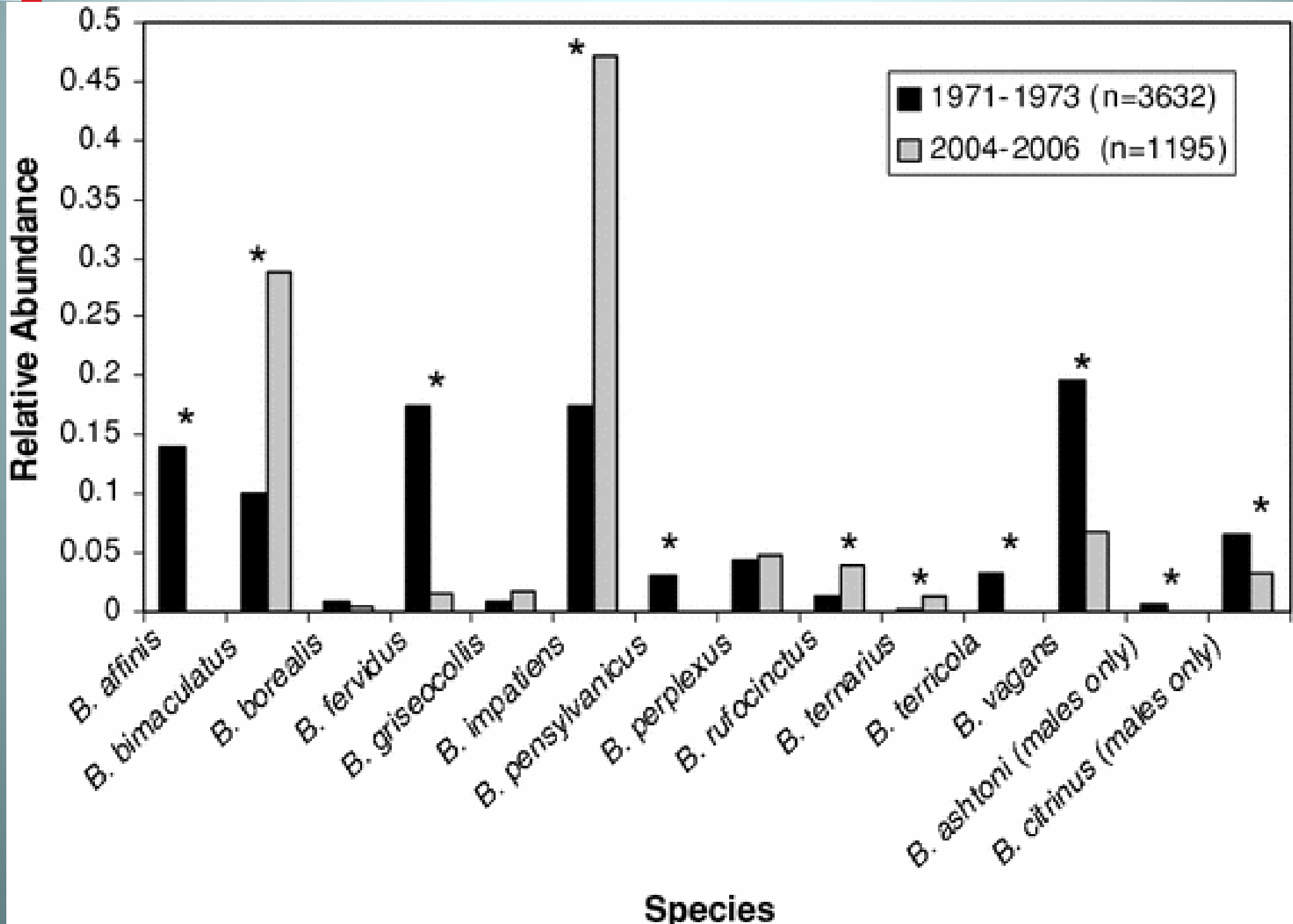
because:

2: the decrease was so severe that the species must have decreased by 50% in the recent past and the decline is not fully understood, may not have ceased and may not be reversible

c: IAO and EO at least must have declined **e:** the decrease was thought to be through pathogens and pesticides & has not ceased.



Bombus Survey Data, Guelph Area, 1971-3; 2004-6



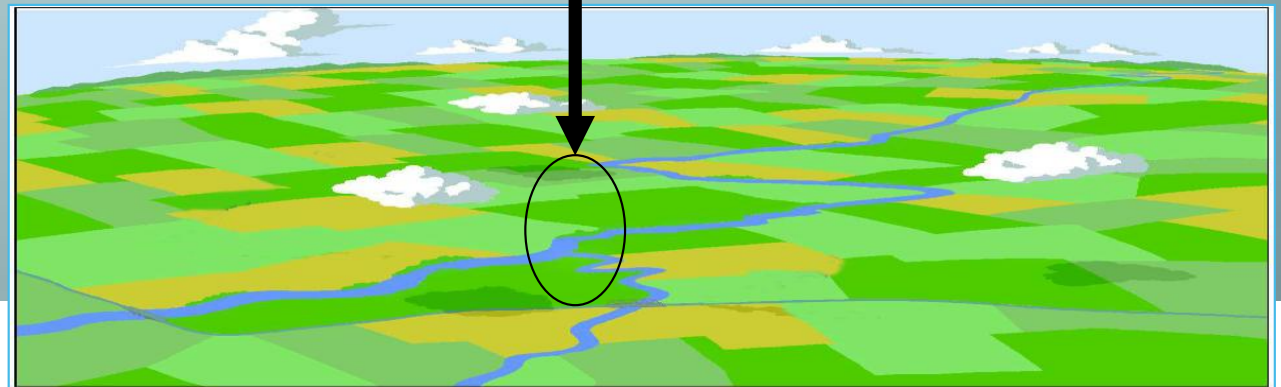


Assessment Criteria

Criterion B:

Small distribution range and decline or fluctuation

Used 26 times (72%) by our SSC





Criterion B

Small distribution must be based on either :

	Endangered	Threatened
B1. Extent of occurrence	< 5,000 km ²	< 20,000 km ²
<u>AND/OR</u>		
B2: Index of area of Occupancy	< 500 km ²	< 2,000 km ²

And at least two of a-c:

a. Severely fragmented or few locations

b. Continuing decline

c. Extreme fluctuations



Criterion B

EXAMPLE:

Rapids Clubtail –

Gomphus quadricolor

Status: Endangered

Criteria: **B1ab(iii)+2ab(iii)**

Rationale: Meets Endangered

B1ab(iii)+2ab(iii) since

(B1) the known extent of occurrence (1570 km²) is less than 5000 km² &

(B2) the index of area of occupancy (26 km²) is less than 500 km².

(a) It is known from few locations,

(biii) continuing decline in habitat quality is expected.



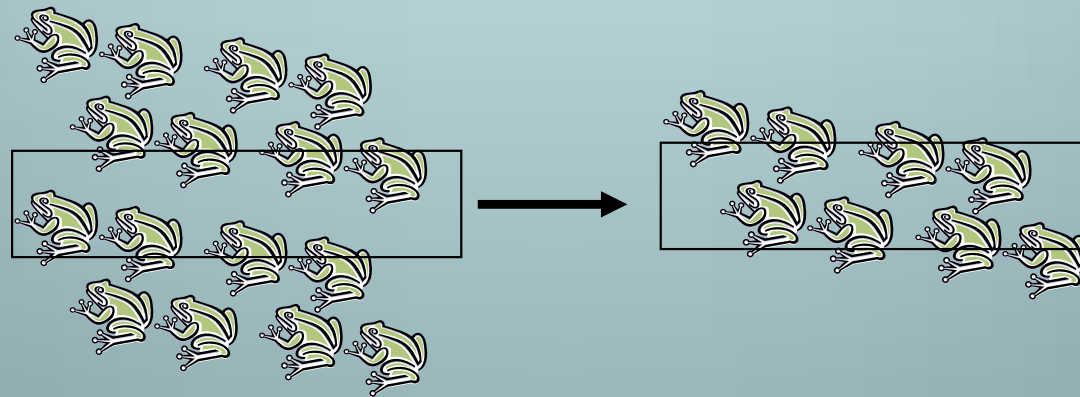


Assessment Criteria

Criterion C:

Small population

and declining number of mature individuals
(used 3 times – 8% - by our SSC)





Criterion C

Based on small population size :

	Endangered	Threatened
Total number of mature individuals	< 2,500	< 10,000

And either C1 or C2 :

C1: Continuing decline in population size at a **specified rate**

OR

C2: Continuing decline in population size at **any, unspecified, rate** AND small population size, few populations or fluctuation

Criterion C

EXAMPLE:

Wallis' Dark Saltflats Tiger Beetle

Cicindela parowana wallisi

Status: Endangered

Criteria: B12ab(iii) + C2aii

Rationale: Thought to occur at just one location though 5 known historically, thus

(C2) continuing decline inferred and

(aii) this population likely to contain all individuals





Assessment Criteria

Criterion D:

**Very Small or Restricted Total Population
(used 6 times – 17% by our SSC)**



Criterion D:



Very small or restricted total population

	Endangered	Threatened
D1: Population estimated to have	< 250 mature individuals	< 1,000 mature individuals
D2: Population with very restricted AO or number of locations *AND* prone to effects of human activities or stochastic events within a very short time period.	N/A	Area of occupancy < 20km ² or ≤ 5 locations

Criterion D

EXAMPLES:

Aweme Borer *Papaipeme aweme*

Status: Endangered

Criteria: D1

Rationale: One individual has been found in 70 years despite considerable search effort in its three known localities in Canada. Thus, population inferred to be less than 250 (I doubt we'd get away with this now).

Poweshiek Skipperling *Oarisma poweshiek*

Status: Threatened

Criteria: D2

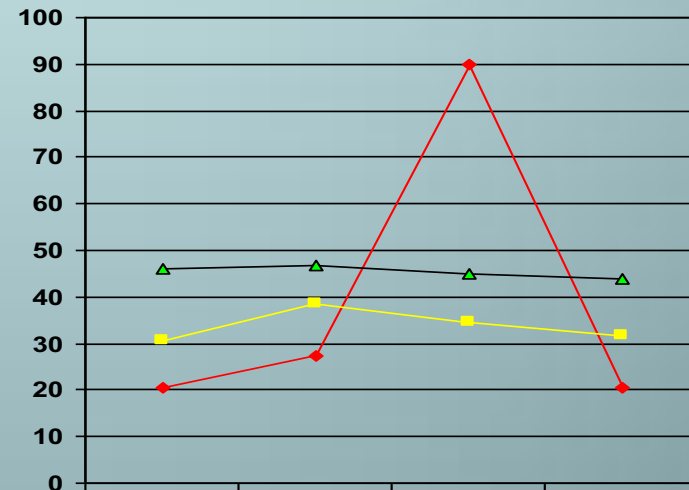
Rationale: AO is ~20km² in one metapopulation





Assessment Criteria

Criterion E: Quantitative Analysis (not yet used by our SSC)





Some Inconsistencies

What actually happens at the species assessment meeting (SAM – two a year) depends on many things:

How good the data are and/or how well written the report

How well the argument is made by ssc co-chair

Who is paying attention, has read the report in detail and
come prepared with counterarguments

Whether it is before or after lunch or a coffee break

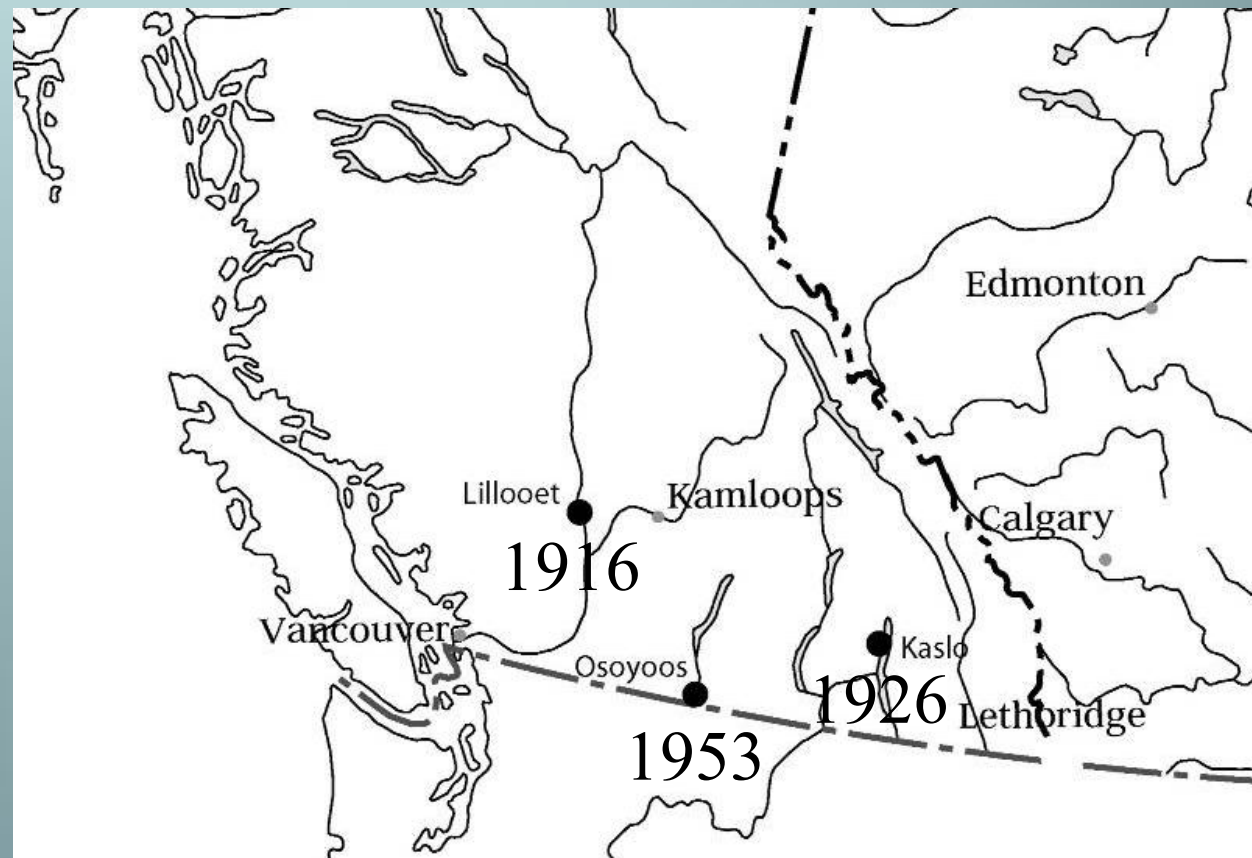
Copablepharon absidum

SSC recommendation:
Extirpated

Report writer visited 7
suitable sites including 2
of 3 historic ones

COSEWIC discussions
tended towards Data
Deficient largely because
of unsurveyed apparently
suitable habitat in BC

Co-Chair decided to
withdraw the species





Epeoloides pilosulus

SSC suggested Special Concern

The 2002 site only was revisited

COSEWIC straw ballots were
all over the place



Wood Mountain
June 25 1955
A. W. Bradley



Number of Canadian Bumble Bee specimens in the database sorted by decade:

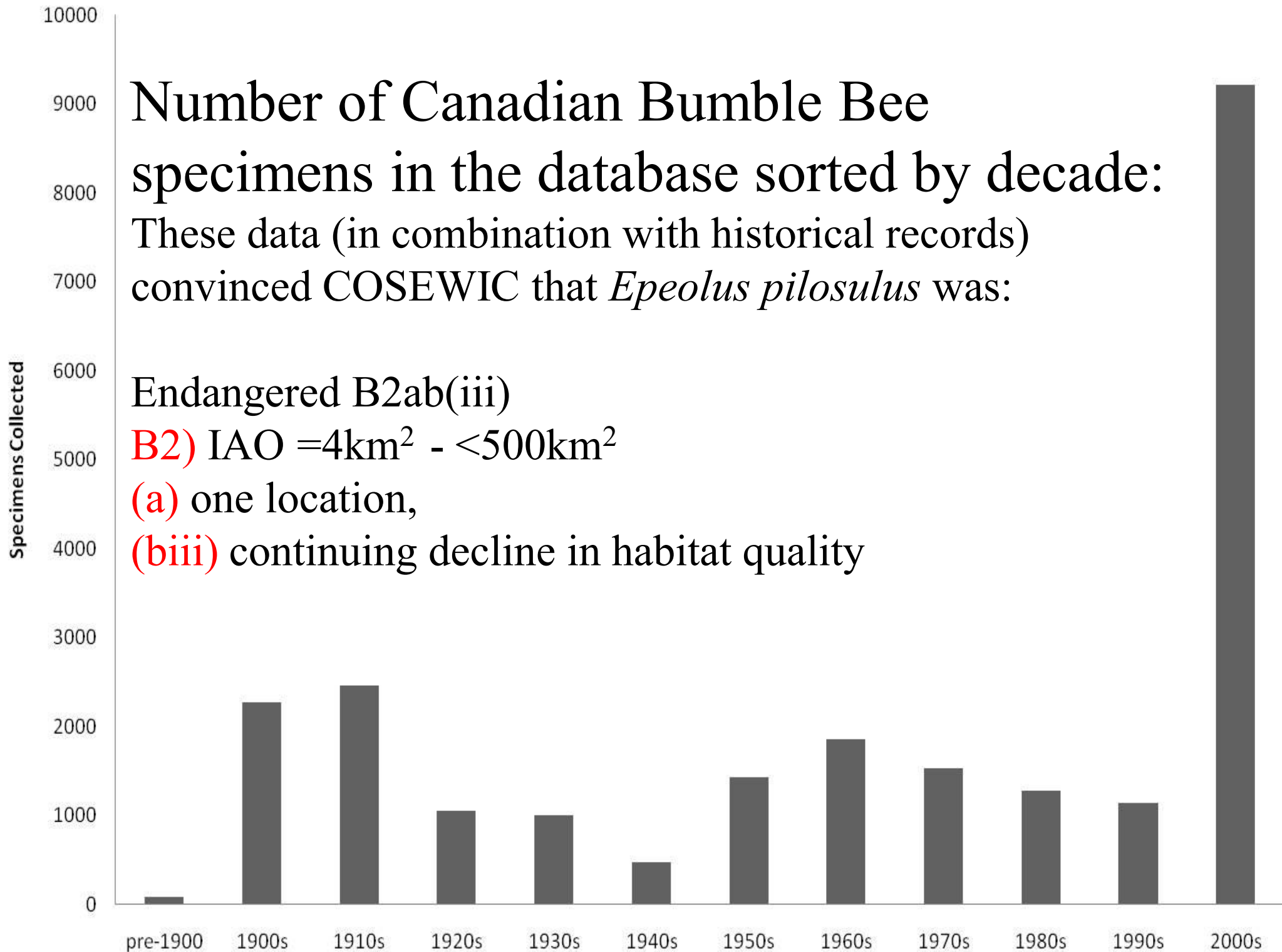
These data (in combination with historical records) convinced COSEWIC that *Epeolus pilosulus* was:

Endangered B2ab(iii)

B2) IAO = 4km² - <500km²

(a) one location,

(biii) continuing decline in habitat quality



Insect data are often different



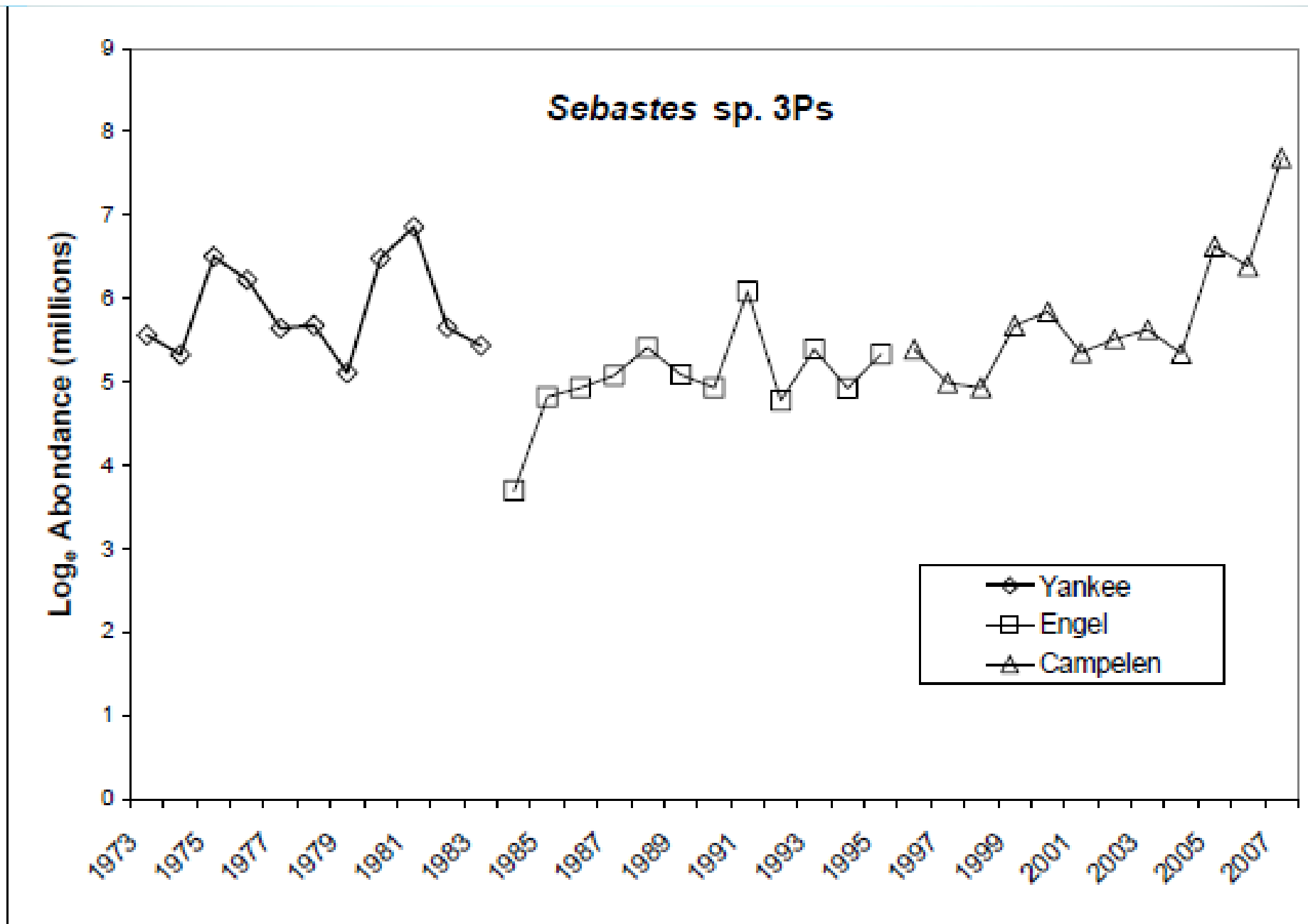


Figure 25: Survey abundance of *Sebastes* sp. in Division 3Ps, Gulf of St. Lawrence/Laurentian Channel DU, ln transformed. The type of gear used is indicated in the legend. Figure 25: Survey abundance of *Sebastes* sp. in Division 3Ps, Gulf of St. Lawrence/Laurentian Channel DU, ln transformed. The type of gear used is indicated in the legend.

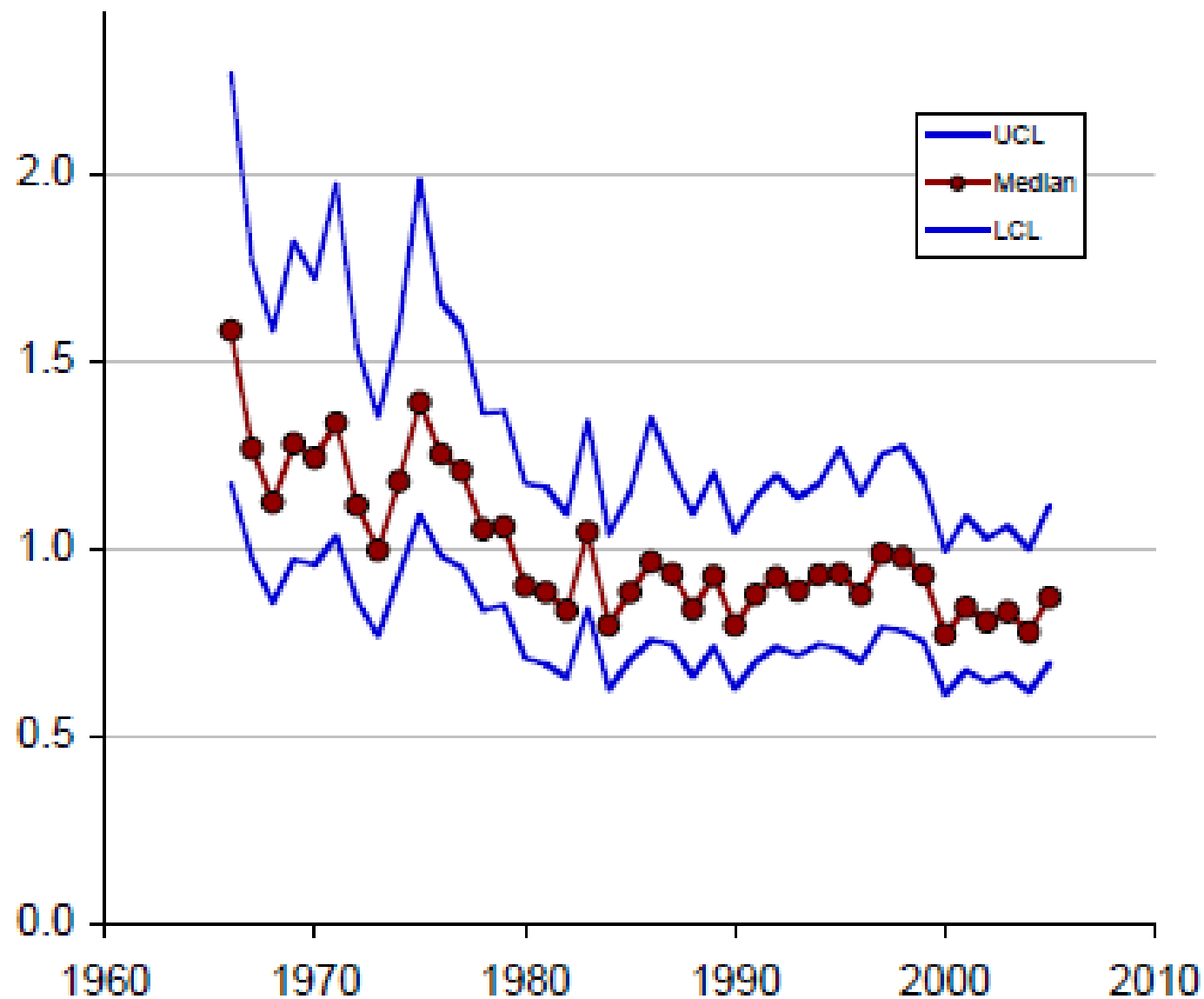
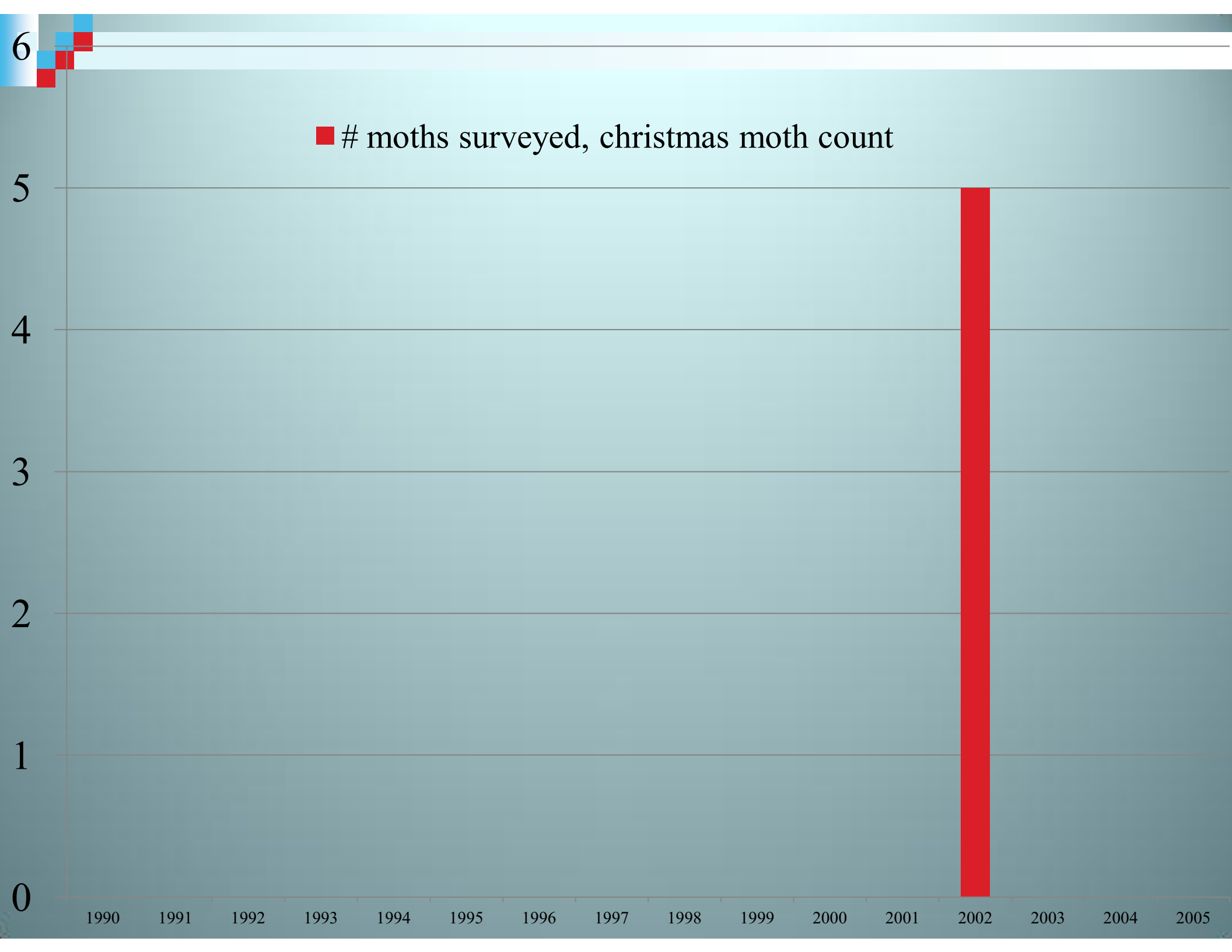


Figure 5. Indices of relative abundance for Horned Grebes observed during all Christmas Bird Counts in the United States and Canada from 1966 to 2005 (data from the National Audubon Society, 2006).





What Use are Biodiversity Survey Data in the COSEWIC context?

1. Any records at all may be useful
2. Repeated visits to the same sites at the same time(s) of year and under similar circumstances are particularly useful
3. Detailed collection databasing can be convincing: museum collections are essential



THREAT ADVISORY



The Current Threat Advisory is
HIPPOPOTAMUS

Please Report any Suspicious Activity To Airport
Police or the Nearest TSA Personnel
DO NOT Leave Baggage Unattended
Thank You For Your Patience

www.TSA.gov

Homeland Security ends color-coded threats

Posted Jan 27, 2011, 9:15 pm

THREAT ADVISORY




HIPPOPOTAMUS Threat of Terrorist Attack

The Current Threat Advisory is
HIPPOPOTAMUS

Please Report any Suspicious Activity To Airport
Police or the Nearest TSA Personnel

DO NOT Leave Baggage Unattended
Thank You For Your Patience.



**Using the IUCN threat
classification scheme and
the NatureServe threat
assessment tool -
we are attempting to
predict the future**



Threats:

- 11 first-level threats:
 1. Residential & Commercial Development
 2. Agriculture & Aquaculture
 3. Energy Production & Mining
 4. Transportation & Service Corridors
 5. Biological Resource Use
 6. Human Intrusions & Disturbance
 7. Natural System Modifications
 8. Invasive & Other Problematic Species & Genes
 9. Pollution
 10. Geological Events
 11. Climate Change & Severe Weather

The threat level is assessed through Scope and Severity

- **Scope** - “the proportion of the population that can reasonably be expected to be affected by the Threat within ten years with continuation of current circumstances”
- **Future only** – 10yrs, 3 generations

IUCN-CMP [draft] Scope of Threats Scoring	
Pervasive	Affects all or most (71–100%) of the total population or occurrences
Large	Affects much (31–70%) of the total population or occurrences
Restricted	Affects some (11–30%) of the total population or occurrences
Small	Affects a small (1–10%) proportion of the total population or occurrences

Severity


IUCN-CMP [draft] Severity of Threats Scoring	
Extreme	Within the scope, the Threat is likely to destroy or eliminate the occurrences of an ecological community, system or species, or reduce the species population by 71–100%
Serious	Within the scope, the Threat is likely to seriously degrade/reduce the effected occurrences or habitat or, for species, to reduce the species population by 31–70%
Moderate	Within the scope, the Threat is likely to moderately degrade/reduce the effected occurrences or habitat or, for species, to reduce the species population by 11–30%
Slight	Within the scope, the Threat is likely to only slightly degrade/reduce the effected occurrences or habitat or, for species, to reduce the species population by 1–10%

Impact

- The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened.
- Based on the interaction between **scope** and **severity** values
- reflects a reduction of a species population

		Scope (%)			
		Pervasive	Large	Restricted	Small
Severity (%)	Extreme	50–100	22–70	8–30	1–10
	Serious	22–70	10–49–	3–21	1–7
	Moderate	8–30	3–21	1–9	0.1–3
	Slight	1–10	0–7	1–3	<1

■ Very High
■ High
■ Medium
■ Low



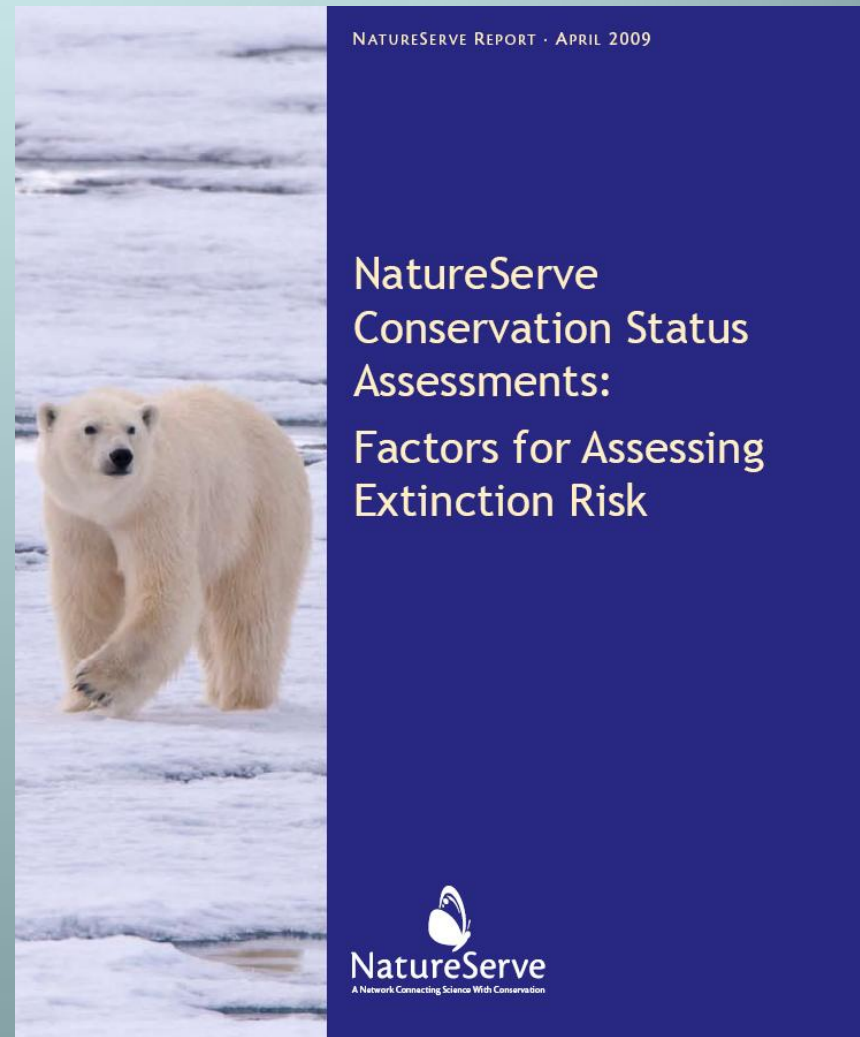
Suggests a change in the way we do our fieldwork

- In addition to performing traditional biodiversity surveys/insect collecting perhaps we should also assess, in as much detail as possible, the threats that the habitat(s) surveyed may be facing – over the next 3 generations or 10 years – whichever is longer.
- At least this is what report writers might be expected to do in their 2-3 days allocated fieldwork

- The threats to be considered are outlined in detail in the “threatulator” (Bennett, 2010*).

- **See also:** Salafsky, N., et al 2008. A standard lexicon for biodiversity conservation: unified classifications of threats and actions. *Conservation Biology* 22:897-911.

- *The reference is to the oral tradition invented at the ssc meeting in 2010



THANKS



- COSEWIC members (especially Paul Catling and Dave Fraser), SSC members, report writers especially Sheila Colla
- NSERC
- Image credits
 - Taylor's checkerspot, photo by Jennifer Heron
 - Behr's Hairstreak, photo by Jennifer Heron
 - Maritime Ringlet, photo by A.W.Thomas
 - Hungerford's Crawling Water Beetle, photo by Stephen Marshall
 - Dune Tachinid, photo by Shannon Mahony
 - Monarch, photo by Dale Clark
 - Edwards' Beach Moth, and *C. absidum* photos by Gary Anweiler
 - Rusty-patched Bumble Bee, photo by Sheila Colla
 - *Epeoloides pilosulus* photo by Cory Sheffield
 - Rapids Clubtail, photo by A.Harris and R.Foster
 - Wallis' Dark Saltflats Tiger Beetle, photo by David Kavanaugh
 - Poweshiek Skipperling, photo by Robert Dana