Terms of Reference

**Review of DFO Science information for American plaice
(*Hippoglossoides platessoides*) relevant to status assessment by COSEWIC**
Meeting of the DFO Science Advisory Process
Conception Bay Room, Holiday Inn, 180 Portugal Cove Road
St. John's, NL
September 4-7, 2007
Chairperson: D. Kulka (DFO Science – NL Region)

Context

The implementation of the federal *Species at Risk Act* (SARA), proclaimed in June 2003, begins with an assessment of a species' risk of extinction by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). COSEWIC is a non-government scientific advisory body that has been established under Section 14(1) of SARA to perform species assessments which provide the scientific foundation for listing species under SARA. Therefore, an assessment initiates the regulatory process whereby the competent Minister must decide whether to accept COSEWIC's assessment and add a species to Schedule 1 of SARA, which would result in legal protection for the species under the Act.

DFO, as the primary generator and archivist of information on aquatic species, is to provide COSEWIC with the best information available to ensure that an accurate assessment of the status of a species can be undertaken.

American plaice (*Hippoglossoides platessoides*) was listed on COSEWIC's fall 2006 Call for Bids to produce a status report and thus has commenced the assessment process for this species.

Objectives

The overall objective of the meeting is to peer-review DFO information relevant to the COSEWIC status assessment for American plaice, considering data related to the status and trends of, and threats to American plaice inside and outside of Canadian waters, and the strengths and limitations of the information. This information will be available to COSEWIC, the authors of the status report and the Chairs of the Marine Fishes COSEWIC Species Specialist Subcommittee.

DFO Science information relevant to the following will be reviewed to the extent possible:

1. Life history characteristics

- Growth parameters: age and/or length at maturity, maximum age and/or length
- Fecundity
- Generation time
- Early life history patterns
- Specialised niche or habitat requirements, including critical habitat and residence descriptions.

2. **Review of designatable units -** See COSEWIC 2005 "Guidelines for Recognizing Designatable Units below the Species Level" (Appendix 1 attached). Discussion on the species will consider available information on population differentiation, which could support a COSEWIC decision of which populations below the species' level would be suitable for assessment and designation.

3. **Apply COSEWIC criteria** (Appendix 2) for species in Canada as a whole, and for designatable units identified (if any), using information in the most recent assessment:

COSEWIC Criterion - <u>Declining Total Population</u>

a. Summarize overall trends in population size (both number of mature individuals and total numbers in the population) over as long a period as possible and in particular for the past three generations (taken as mean age of spawners). Additionally, present data on a scale appropriate to the data to clarify the rate of decline.

b. Identify threats to abundance— where declines have occurred over the past three generations, summarize the degree to which the causes of the declines are understood, and the evidence that the declines are a result of natural variability, habitat loss, fishing, or other human activity

c. Where declines have occurred over the past three generations, summarize the evidence that the declines have ceased, are reversible, and the likely time scales for reversibility.

COSEWIC Criterion - <u>Small Distribution and Decline or Fluctuation</u>: by stock, for species in Canada as a whole, and for designatable units identified, using information in the most recent assessments:

a. Summarise the current extent of occurrence (in km^2) in Canadian waters
b. Summarise the current area of occupancy (in km^2) in Canadian waters
c. Summarise changes in extent of occurrence and area of occupancy over as long a time as possible, and in particular, over the past three generations.
d. Summarise any evidence that there have been changes in the degree of fragmentation of the overall population, or a reduction in the number of meta-population units.
e. Summarise the proportion of the population that resides in Canadian waters, migration patterns (if any), and known breeding areas.

COSEWIC Criterion - <u>Small Total Population Size and Decline</u> and <u>Very Small and Restricted</u>: by stock, for species in Canada as a whole, and for designatable units identified, using information in the most recent assessments:

a. Tabulate the best scientific estimates of the number of mature individuals;
b. If there are likely to be fewer than 10,000 mature individuals, summarize trends in numbers of mature individuals over the past 10 years or three generations, and, to the extent possible, causes for the trends.

Summarise the options for combining indicators to provide an assessment of status, and the caveats and uncertainties associated with each option.

For transboundary stocks, summarise the status of the population(s) outside of Canadian waters. State whether rescue from outside populations is likely.

As time allows, review status and trends in other indicators that would be relevant to evaluating the risk of extinction of the species. This includes the likelihood of imminent or continuing decline in the abundance or distribution of the species, or that would otherwise be of value in preparation of COSEWIC Status Reports.

Outputs

The meeting will produce:

1. One Research Document for American plaice, summarising the overall status of the species and the data and information held by DFO which could be used by COSEWIC in making status designations.
2. Proceedings summarizing the decisions, recommendations and major points of discussion at the meeting, including reflection of the diversity of opinion.

Participation

Participation will be solicited from the following:
- DFO Science, Oceans and Habitat, Fisheries Management, SARA, and Policy & Economics (Newfoundland and Labrador, Central & Arctic, Maritimes, Gulf, Quebec and National Capital Region)
- COSEWIC Species Specialist Subcommittee Co-Chairs
- Other Federal Departments and Agencies
- Provincial Departments from each Region
- Nunavut Wildlife Management Board
- Fish Food and Allied Workers Union
- Academia
- Non-Governmental Organizations
- Industry Groups

Appendix 1. Guidelines for recognizing Designatable Units Below the Species Level

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Approved by COSEWIC in April 2006
Approved by CESCC in October 2006

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Preamble:

It is widely recognised that species status assessment and conservation of biological diversity require that populations below the species level (using "species" in the accepted sense of the taxonomic hierarchy) be considered when appropriate. Most legislation allows for status designation of populations below the species level. For example, the federal Species at Risk Act (SARA) includes subspecies, varieties and "geographically or genetically distinct" populations in its definition of wildlife species thus allowing for listing of populations below the species level. COSEWIC's recognition of populations below the species level for assessment (i.e. designatable units) is guided by the same general objective of preventing wildlife species from becoming extinct or extirpated.

COSEWIC strives to recognize designatable units that are significant and irreplaceable units of biodiversity yet there are difficulties inherent in achieving a uniform interpretation of the word "significant". Furthermore, because patterns of population structure, life history, and genetic variability differ across taxonomic groups, use of uniform criteria in determining appropriate designatable units *a priori* can be difficult. Guidelines are needed in order to interpret, on a case-by-case basis, what constitutes a significant element of biological diversity to be recognized for the purpose of conservation status assessment by COSEWIC.

Approach:

COSEWIC's usual approach to assigning status is, first, to examine the species as a whole and then, if deemed appropriate, to examine the status of designatable units below the species level.

In cases where particular designatable units are strongly suspected of being at risk, or where they are so different in distribution or conservation status that an overall assessment would not capture the conservation concerns, COSEWIC will assess single designatable units below the species level.

Status may be assigned to subspecies, varieties, or geographically or genetically distinct populations which may be recognized in cases where a single status designation for a species is not sufficient to accurately portray probabilities of extinction within the species. Designatable units are to be recognized in accordance with the following guidelines.

Guidelines:

Specifically, the units to which status may be assigned below the species level are recognized on the basis of any one of the four criteria (1 - 4) described below. Typically, COSEWIC will consider, in order of precedence, 1) established taxonomy, 2) genetic evidence, 3) range disjunction, and 4) biogeographic distinction.

1) named subspecies or varieties:
      published subspecies of animals according to the Code of Zoological Nomenclature or published subspecies or varieties of plants according to the Code of Botanical Nomenclature.
      ***Examples*:**
      Water Snake: *Nerodia sipedon sipedon* (NAR), *N. s. insularum* (E)
      Loggerhead Shrike: *Lanius ludovicianus migrans* (E), *L. l. excubitorides* (T)

or,

2) units identified as genetically distinctive:
      evidence of genetic distinctiveness including, but not limited to, appropriate inherited traits (morphological, life history, behaviour) and/or genetic markers (e.g. allozymes, DNA microsatellites, DNA restriction fragment length polymorphisms (RFLPs), DNA sequences, etc.).
      Example:
      Coho salmon: Interior Fraser River (E), as opposed to other populations

or,

3) units separated by major range disjunction:
      disjunction between substantial portions of the species' global geographic range such that dispersal of individuals between separated regions has been severely limited for an extended period of time and is not likely in the foreseeable future.
      Examples:
      Boreal Felt Lichen: Atlantic (E), Boreal (SC)
      Blanding's Turtle: Atlantic population (T), as opposed to other populations

or,

4) units identifed as biogeographically distinct:
      occupation of differing eco-geographic regions that are relevant to the species and reflect historical or genetic distinction, as may be depicted on an appropriate ecozone or biogeographic zone map (Figs. 1 - 3).
      Examples:
      Mormon Metalmark: Southern Mountain population (E), Prairie   population (T).
      Woodland Caribou: an assortment of designations based on biogeographic zones.

Precautions:

Appropriate caution in interpreting data should be exercised when identifying designatable units. The biological significance of phenotypic, genetic or geographic variation, must be considered in light of potential limitations in the data available. Inadequate information on temporal variability, insufficient sample sizes, or evidence from inappropriate traits (those which are either inordinately variable or overly conservative) will compromise the significance of available information.

Separate status designations should **not** be recognized for management units that are not based on biological criteria consistent with these guidelines.

When a COSEWIC assessment has been conducted using designatable units below the

species level, and adjacent designatable units are classified as having the same status, on the basis of the same criteria, then COSEWIC may apply a single status assessment to those units if a single assessment better addresses the conservation status of the units that are combined.

APPENDIX 2: COSEWIC Assessment Process, Categories and Guidelines

Revised and Approved by COSEWIC in April 2007
Submitted for approval by CESCC in fall 2007

Table 1: Determining eligibility of species for status assessment.

COSEWIC considers without prejudice all wildlife species as defined by SARA, notwithstanding the extent of their extra-limital range (i.e., the range of the species outside Canada), subject to the following criteria:

A) Taxonomic validity

COSEWIC would normally only consider species and subspecies or varieties that have been established as valid in published taxonomic works or in peer reviewed communications from taxonomic specialists. COSEWIC would not normally consider other designatable units unless they can be shown to be genetically distinct, separated by a major range disjunction, or biogeographically distinct (refer to Guidelines for Designatable Units Below the Species Level, Appendix F5). Justification for considering designatable units below the species level must be provided.

B) Native species

COSEWIC would normally only consider native species. A native species is a wild species that occurs in Canada naturally, or that has expanded its range into Canada without human intervention from a region where it naturally occurred, has produced viable populations, and has persisted in Canada for at least 50 years.

C) Regularity of occurrence

COSEWIC would normally only consider species which occur or formerly have occurred regularly in Canada including regular or seasonal migrants but excluding vagrants.

D) Special cases

Notwithstanding the above guidelines, a taxon may be considered eligible if there are clear conservation reasons for consideration (for example high risk of extinction). In particular, a species which does not meet the eligibility criteria but which is at risk in its primary range outside of Canada could be considered for designation.

Reasons for considering a special case must be presented and supporting information must be provided; this should normally be reviewed and agreed to by COSEWIC before a status report is prepared.

Table 2: COSEWIC quantitative criteria and guidelines for the status assessment of species.

COSEWIC's revised criteria to guide the status assessment of species. These were in use by COSEWIC by November 2001, and are based on the revised IUCN Red List categories (IUCN 2001[1]). An earlier version of the quantitative criteria was used by COSEWIC from October 1999 to May 2001. For definitions of terms marked in bold italics, see COSEWIC's Glossary of Definitions and Abbreviations (Appendix C).

	Endangered	**Threatened**

A. Declining Total Population

Reduction in population size based on any of the following 4 options and specifying a-e as appropriate:

	Endangered	**Threatened**
(1) population size reduction that is observed, estimated, inferred, or suspected in the past 10 years or 3 generations, whichever is longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) one or more of a-e below.	$\geq 70\%$	$\geq 50\%$
(2) population size reduction that is observed, estimated, inferred or suspected over the last 10 years or 3 generations, whichever is longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) one or more of a-e below.	$\geq 50\%$	$\geq 30\%$

(3) population size reduction that is projected or suspected to be met within in the next 10 years or 3 generations, whichever is longer (up to a maximum of 100 years), based on (and specifying) one or more of b-e below.

(4) population size reduction that is observed, estimated, inferred, projected or suspected over any 10 year or 3 generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period includes both the past and the future, AND where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) one or more of a-e below.

a) direct observation
b) an index of abundance appropriate for the taxon
c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
d) actual or potential levels of exploitation
e) the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites

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[1] IUCN 2001. *IUCN* Red List Categories and Criteria: Version 3.1. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

	Endangered	Threatened

B. Small Distribution, and Decline or Fluctuation

	Endangered	Threatened
1. Extent of occurrence	$< 5,000$ km^2	$< 20,000$ km^2
Or		
2. Area of occupancy	< 500 km^2	$< 2,000$ km^2

For either of the above, specify at least two of a-c:

	Endangered	Threatened
(a) either severely fragmented or known to exist at # locations	≤ 5	≤ 10

(b) continuing decline observed, inferred or projected in one or more of the following:

i) extent of occurrence
ii) area of occupancy
iii) area, extent and/or quality of habitat
iv) number of locations or populations
v) number of mature individuals

	Endangered	Threatened
(c) extreme fluctuations in one or more of the following:	> 1 order of magnitude	> 1 order of magnitude

i) extent of occurrence
ii) area of occupancy
iii) number of locations or populations
iv) number of mature individuals

C. Small Total Population Size and Decline

	Endangered	Threatened
Number of mature individuals	$< 2,500$	$< 10,000$

and 1 of the following 2:

	Endangered	Threatened
(1) an estimated continuing decline rate of at least:	20% in 5 years or 2 generations whichever is longer (up to a maximum of 100 years in the future)	10% in 10 years or 3 generations whichever is longer (up to a maximum of 100 years in the future)

(2) continuing decline, observed, projected, or inferred, in numbers of mature individuals and at least one of the following (a-b):

	Endangered	Threatened
(a) population structure in the form of one of the following:	(i) no population estimated to contain >250 mature individuals	(i) no population estimated to contain >1,000 mature individuals
	(ii) at least 95 % of mature individuals in one population	(ii) all mature individuals are in one population

(b) extreme fluctuations in the number of mature individuals

D. Very Small Population or Restricted Distribution

(1) number of mature individuals estimated to be Or	< 250	< 1,000
(2) Applies only to threatened:	Population with a very restricted area of occupancy (area of occupancy typically < 20 km²) or number of locations (typically 5 or fewer) such that it is prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and thus is capable of becoming highly endangered or even extinct in a very short time period.	

E. Quantitative Analysis

Indicating the probability of extinction in the wild to be at least:	20% in 20 years or 5 generations, whichever is longer (up to a maximum of 100 years)	10% in 100 years

Special Concern:

those species that are particularly sensitive to human activities or natural events but are not endangered or threatened species.

Species may be classified as being of Special Concern if:
  (a) the species has declined to a level of abundance at which its persistence is increasingly threatened by genetic, demographic or environmental stochasticity, but the decline is not sufficient to qualify the species as Threatened; or
  (b) the species is likely to become Threatened if factors suspected of negatively influencing the persistence of the species are neither reversed nor managed with demonstrable effectiveness; or
  (c) the species is near to qualifying, under any criterion, for Threatened status; or
  (d) the species qualifies for Threatened status but there is clear indication of rescue effect from extra-limital populations.

Examples of reasons why a species may qualify for "Special Concern":

• a species that is particularly susceptible to a catastrophic event (e.g., a seabird population near an oil tanker route); or
• a species with very restricted habitat or food requirements for which a threat to that habitat or food supply has been identified (e.g., a bird that forages primarily in old-growth forest, a plant that grows primarily on undisturbed sand dunes, a fish that spawns primarily in estuaries, a snake that feeds primarily on a crayfish whose habitat is threatened by siltation; or
• a recovering species no longer considered to be Threatened or Endangered but not yet clearly secure.

Examples of reasons why a species may not qualify for "Special Concern":

• a species existing at low density in the absence of recognized threat (e.g., a large predatory animal defending a large home range or territory); or
• a species existing at low density that does not qualify for Threatened status for which there is a clear indication of rescue effect.

Guidelines for use of Extinct or Extirpated

A species may be assessed as extinct or extirpated from Canada if:
- there exists no remaining habitat for the species and there have been no records of the species despite recent surveys; or
- 50 years have passed since the last credible record of the species, despite surveys in the interim; or
- there is sufficient information to document that no individuals of the species remain alive.

Guidelines for use of Data Deficient

Data Deficient should be used for cases where the status report has fully investigated all best available information yet that information is insufficient to: a) satisfy any criteria or assign any status, or b) resolve the species' eligibility for assessment.

Examples:
- Records of occurrence are too infrequent or too widespread to make any conclusions about extent of occurrence, population size, threats, or trends.
- Surveys to verify occurrences, when undertaken, have not been sufficiently intensive or extensive or have not been conducted at the appropriate time of the year or under suitable conditions to ensure the reliability of the conclusions drawn from the data gathered.
- The species' occurrence in Canada cannot be confirmed or denied with assurance.

Data Deficient should **not** be used if: a) the choice between two status designations is difficult to resolve by COSEWIC, or b) the status report is inadequate and has not fully investigated all best available information (in which case the report should be rejected), or c) the information available is minimally sufficient to assign status but inadequate for recovery planning or other such use.

Table 3: Guidelines for modifying status assessment based on rescue effect.

COSEWIC's approach to assigning status is, first, to examine the Canadian status of a species or other Designatable Unit in isolation and then, if deemed appropriate, to consider the potential for "rescue" from extra-regional populations (e.g., from across an international boundary or from another Designatable Unit within Canada). The rescue effect is the immigration of gametes or individuals that have a high probability of reproducing successfully, such that extirpation or decline of a species, or some other Designatable Unit, can be mitigated. If the potential for rescue is high, the risk of extirpation may be reduced, and the status may be downgraded. COSEWIC addresses this by applying the following guidelines developed by IUCN for this purpose (Gardenfors et al. 1999[2]).

Likelihood of propagule migration

Are there any extra-regional populations within a distance from which propagules could reach the region? Are there any effective barriers preventing dispersal to and from extra-regional populations? Is the species capable of long-distance dispersal? Is it known to do so?

If there are no extra-regional populations or propagules are not able to disperse to the region, the regional population behaves as an endemic and the status category should be left unchanged.

Evidence for the existence of local adaptations

Are there any known differences in local adaptation between regional and extra-regional populations, i.e. is it probable that individuals from extra-regional populations are adapted to survive within the region?

If it is unlikely that individuals from extra-regional populations would be able to survive within the region, the status category should be left unchanged.

Availability of suitable habitat

Are current conditions of habitats and/or other environmental (including climatological) requirements of the taxon in the region such that immigrating propagules are able to successfully establish themselves (i.e. are there inhabitable patches), or has the taxon disappeared from the region because conditions were not favourable?

If there is not enough suitable habitat and current conservation measures are not leading to an improvement of the habitat within a foreseeable future, immigration from outside the region will not decrease extinction risk and the status category should be left unchanged.

Status of extra-regional populations

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[2] Gardenfors, U., J.P.Rodriquez, C. Hilton-Taylor, C. Hyslop, G. Mace, S. Molur and S. Poss. 1999. *Draft guidelines for the application of Red List criteria at national and regional levels*. Species 31-32:58-70.

How abundant is the taxon in neighbouring regions? Are the populations there stable, increasing or decreasing? Are there any important threats to those populations? Is it probable that they produce an appreciable number of emigrants, and will continue to do so for the forseeable future?

If the taxon is more or less common outside the region and there are no signs of population decline, and if the taxon is capable of dispersing to the region and there is (or soon will be) available habitat, downgrading the category is appropriate. If the population size of extra-regional populations is declining, the 'rescue effect' is less likely to occur, hence downgrading the status category may not be appropriate.

Degree of dependence on extra-regional sources

Are extant regional populations self-sustaining (i.e. have they shown a positive reproductive rate over the years) or are they dependent on immigration for long-term survival (i.e. are the regional populations sinks)?

If there is evidence that a substantial number of propagules regularly reach the region and the population still has a poor survival, the regional population may be a sink. If so, and there are indications that the immigration will soon cease, upgrading the status category may be appropriate.

Table 4: Policy for modifying status assessment based on quantitative criteria

COSEWIC, IUCN and other groups recognize the need for additional assessment tools. Specifically, there is a need to consider life-history variation amongst species and other taxa. COSEWIC has developed the following guideline:

In addition to the quantitative guidelines, COSEWIC will base its assessment on the degree to which various life-history characteristics (e.g., age & size at maturity, dispersal strategy, longevity) affect extinction probability and the likelihood that the species is vulnerable to the Allee effects of density dependence.

All else being equal:

- species with delayed age at maturity tend to be at greater risk of extinction than species with early age at maturity;
- for indeterminately growing organisms (species that continue to grow after attaining maturity), larger species tend to be at greater risk of extinction than smaller species;
- species with low dispersal tend to be at greater risk of extinction than species with high dispersal; and
- species with non-overlapping generations tend to be at greater risk of extinction than species with overlapping generations.

Table 5: COSEWIC status categories.

Extinct (X) - A wildlife species that no longer exists.

Extirpated (XT*)* - A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.

Endangered (E) - A wildlife species facing imminent extirpation or extinction.

Threatened (T) - A wildlife species likely to become endangered if limiting factors are not reversed.

Special Concern (SC) - A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

Data Deficient (DD) - 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.

Not At Risk (NAR*)* - A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.