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“Flyway Conservation at Work – Review of the Past, Vision for the Future”

**DRAFT GUIDANCE FOR INTERPRETATION OF CRITERIA USED IN
TABLE 1 OF THE AEWA ACTION PLAN**

Introduction

In its Resolution 3.3 the Meeting of the Parties called upon the Technical Committee to develop guidance for interpretation of the following criteria used in Table 1 of the Action Plan:

- 1) the degree of concentration on a small number of specific sites at any stage of annual cycle;
- 2) the dependence on a habitat type which is under severe threat; and
- 3) the extent of extreme fluctuations in population size and trend.

The Technical Committee addressed this request of the Meeting of the Parties over the triennium 2006-2008 and has elaborated a proposal for such guidance for the first two criteria above. Criterion 3 was addressed too, but it was suggested that in order to finalise the work, external support by a statistician will be needed. Due to the lack of possible funding, the finalisation of the work on this last point was postponed to the next triennium (quadriennium).

This document presents the proposal of the Technical Committee for definitions of two Table 1 criteria as well as additional guidance on their application. This proposal was signed off by the Standing Committee at its 5th meeting in June 2008 for submission to MOP4.

Action requested from the Meeting of the Parties

The Meeting of the Parties is invited to review the proposed definitions and guidance and approve them for further use.

Guidance for interpretation of the criterion “concentration [*of a waterbird population*] onto a small number of sites at any stage of its annual cycle”

Definition

A population which “concentrates onto a small number of sites at any stage of its annual cycle“ is a population of which 90% or more is localised in 10 or fewer sites in a particular annual cycle stage.

Guidance on the terms “annual cycle stage” and “site” when dealing with populations considered to be at risk as a result of concentration onto a small number of sites at any stage of their annual cycle

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The Technical Committee of AEWA has suggested applying the following definition: “A population which “concentrates onto a small number of sites at any stage of its annual cycle“ is a population of which 90% or more is localised in 10 or fewer sites in a particular annual cycle stage” when identifying flyway populations which are being considered to be at risk as a result of concentration onto a small number of sites at any stage of their annual cycle, i.e. qualifies to be listed in Column A Category 3a (for populations numbering 25,000-100,000 individuals) or Column B Category 2a (for populations numbering more than 100,000 individuals) of Table 1 in the AEWA Action Plan.

Judgments regarding listing a species under this criterion should always be based on the best available information, and this note aims at providing necessary considerations to take, when applying the definition.

Regarding the phrase ‘in a particular annual cycle stage’.

The definition mentions ‘in a particular annual cycle stage’. The aim of that point is to note that any phase of the annual cycle might represent THE bottle-neck for the population, and the size of habitats and food available there would set upper limits for the population size.

Alerstam & Högstedt (1982) developed this idea, but only dealt with two parameters, i.e. ‘breeding’ and ‘survival’. One piece of information they present in combination with simple rationales is that improved management irrespective how good it is in one end of a flyway might not be able to change a negative population development, if problems persist in the other end of the flyway.

However the annual cycle of most migratory waterbirds is composed of several more than two phases, and appropriate management would for most Northern Hemisphere migrants probably involve considering sites for:

1. breeding (egg laying, brooding and chick rearing, energetically costly and might involve significant weight losses of adult breeders)
2. moulting¹ (replacement of feathers, energetically costly and might involve significant weight losses), where some species will perform migrational moves to moult sites distant from their breeding sites
3. post-moult (replenishing body reserves lost during moult/moult migration, fuelling for autumn migration)
4. autumn stop-over(s)(replenishing body reserves lost during migration, fuelling for next migrational moves)

¹ This phase of the annual cycle should especially be considered for species that shed all their flight-feathers at once to replace them, and remain flightless for a longer period, hence are bound to stay at a specific site for the duration of their moult. Usually this happens during or immediately after breeding.

5. wintering (replenishing body reserves lost during autumn migration, build-up surplus body reserves, that can be used to survive if fasting periods are enforced on the birds during winter due to adverse weather conditions, subsequent maintenance of these body reserves, fuelling for spring migration),
6. spring stop-over(s)(replenishing body reserves lost during migration, fuelling for next migrational moves, and build up body stores to invest in breeding²)
7. pre-breeding (replenishing body reserves lost during spring migration, build up body stores to invest in breeding³, both in the immediate vicinity of the subsequent breeding site)

The seven phases mentioned above are typical to many Northern Hemisphere Arctic or boreal breeding waterbirds, most of which flies to winter in more southern parts of the temperate, sub-tropical or tropical zones of the African-Eurasian region, and usually happens in the order described from phase 1 through 7. For intra-African migrants timing of the different phases may be very different, and will for some species be dependant on rainfall-dry period cycles, but the species nevertheless still have to breed, change their feathers, and move between suitable habitats for breeding and moulting, and might have to build-up reserves in order to migrate between the sites used for the different phases.

Hence each individual bird from any population and in any part of the AEWA region is likely to be dependent on at least 5 to 7 (for capital breeders that moult all flight feathers at once) but probably more sites in their annual cycle. Flyway populations would usually use many more sites than the individuals they are composed of do, because individual birds use different suites of sites.

For some very large populations that use commonly dispersed habitats, and additionally have a behaviour, where they travel alone or in small groups, e.g. Woodcock *Scolopax rusticola* or Common Snipe *Gallinago gallinago* – the use of the term site is almost irrelevant, because each bird use a suitable spot probably independent of other individuals.

In contrast other species at least during part of their annual cycle are highly gregarious and moves around in large flocks counting thousands of individuals. For such species the site concept is highly relevant, because any negative impact on the site, whether occurring naturally (e.g. tsunamis, volcanic eruptions, storm surges, flooding or drought), or due to human activities (e.g. oil spills, large-scale infrastructure developments, over-fishing, disturbance) – especially because it obviously could influence thousands of birds.

Regarding the term “site”

To make the definition mentioned above operational the question then arises, what a site is.

A pragmatic approach would be just to use existing site networks such as those used by Wetlands International for their International Waterbird Censuses (IWC) or those used by BirdLife International in their Important Bird Areas (IBA). These site networks represent the two largest waterbird site databases in the AEWA region, and their databases will in the near future be merged under the Wings over Wetlands (WoW) project.

This approach would probably be advisable in most occasions and for most sites already covered by IWC and/or IBA, but birds do not consider national or regional borders which have been implemented by man for administrative reasons – and such borders are present in both the IWC and IBA networks, because data are compiled and organised by national coordinators.

² This applies mainly to capital breeders (sensu Drent & Daan 1980), i.e. being dependant of reserves carried along to the breeding sites from spring stop-overs to be able to lay and incubate eggs.

³ This applies mainly to income breeders (sensu Drent & Daan 1980), i.e. being dependant of reserves collected at the breeding site in order to lay and incubate eggs. The concept of capital vs. income breeders was originally proposed as a dichotomy by Drent & Daan (1980), but Meijer & Drent (1999) revisited the concept and considered it a continuum, with some species being mostly capital breeders, but supplementing reserves at the breeding sites, other species *vice versa*.

Additionally the existing site networks are largely dependant on the degree of detail considered necessary by the national coordinators to run their volunteer and/or professional bird counter networks, and might in some countries be composed of fairly small locations (lakes, sheltered bays and lagoons) where birds are collecting to roost overnight, whereas other countries count the birds in the surroundings of such locations, when the birds are out feeding during day-time.

Regardless of any existing site borders in any existing site network that are solely based on jurisdictional or count-practical reasons, the term 'site' considered by the Technical Committee is meant to be understood as functionally continuous sites composed of uniform habitats or a mosaic of habitats, all of which might be subject to negative impacts such as those mentioned above. The Technical Committee thus consider that sites relevant to the definition are sites composed of closed or convoluted water-bodies that all might be severely influenced by the same negative impact.

This would not mean one has to consider e.g. the whole international Wadden Sea as one site, e.g. because most of the high-tide roosts and adjacent feeding mudflats used by waterbirds on the barrier islands of the Wadden Sea are functionally independent from other high-tide roosts at the mainland coast and their adjacent feeding mudflats used by different groups of birds albeit from the same populations. But the present use of e.g. 100 individual count units in the Danish part of the Wadden Sea (and probably the same number in the Dutch and the double number in the German Wadden Sea) is probably far too many 'sites', because several of these count units belongs to the same 'intertidal gully' and all would be influenced by a nearby accidental offshore oil-spill because oil will be brought in by incoming water during high-tide, or because they share common mainland river-catchments, and would all be affected by an accidental pollution event arriving from the river outflow at low-tide. The international Wadden Sea might thus have to be considered as being composed of approximately 40-50 sites, one for each of the barrier islands plus one for each 'intertidal gully'.

The previously published guidance of Atkinson-Willes et al. (1982) may also be taken in consideration when applying the criteria:

'The application of numerical criteria to wetlands of varying size

27. The sole purpose of the criteria in 1(a), 1(b) and 1(c) is to identify the wetlands in which the numbers of waterfowl are sufficiently large to qualify as internationally important. The eventual definition of the boundaries of the sites designated for the Ramsar List is a different process altogether. In the latter instance there are no limitations on area, except those imposed by administrative practicalities; ideally the boundary should follow the line of the watershed.

28. The following comments relate only to the initial process of site identification, and are concerned mainly with the period outside the breeding season.

29. If the numerical criteria are to achieve their purpose and be properly selective, the requisite numbers of waterfowl must, by implication, be contained in an area of reasonable size. The problem is how best to apply the criteria to very large areas of lake or marsh, or to long stretches of coast or river. We cannot at present define an "area of reasonable size", and offer the following guidelines instead:

a) Many European wetlands of international importance for waterfowl have areas of less than 10,000 ha; we have therefore a basis for comparison. Larger waters should be expected to support proportionately more birds.

b) A continuum of habitat, such as the Rhine or Wadden Sea is correctly regarded as an entity, but it may also contain a number of distinct ecological units, each capable of supporting an independent population. For example, the Dollart, the Jade Basin, the Knechtsand and other similar sites all form part of the Wadden complex, but each is important in its own right, for its own particular interests. Such units ought to be assessed individually, as well as in conjunction. This subdivision into units of more reasonable size would draw attention to the sections of prime importance, would facilitate comparison with other, finite areas of

habitat, and would also have administrative advantages. The boundaries of the units ought to be defined on a strictly ecological basis.

c) On most large lakes the populations of waterfowl are usually concentrated within 500 m of the shore, and have, in effect, a linear distribution around the perimeter. The principles in b) above may therefore be applied.

d) Large areas of marsh and shallow water are difficult to subdivide, and in most cases there is no real need to do so. This type of ecosystem occurs mainly in the semi-arid regions of Africa and Asia, and often provides the only waterfowl habitat in an otherwise barren area. In such cases the size of the population, and the fact of its presence is much more relevant than its density and distribution within the site. The extent of the habitat and the usefulness of the component sections is often critically dependent on the ambient water regime, - much more so than in other types of wetland, - and the need to conserve the site in its entirety is correspondingly greater. The same applies to deltaic marshes.

e) Compact groups of lakes and marshes, as in Les Dombes, may be treated as a unit, with a single population. The size of the unit is immaterial, so long as the distance between adjacent lakes is nowhere more than a few kilometres.'

Examples of site networks and populations which the Technical Committee consider would qualify under the definition: “A population which “concentrates onto a small number of sites at any stage of its annual cycle“ is a population of which 90% or more is localised in 10 or fewer sites in a particular annual cycle stage”

Breeding:

The East African population of Lesser Flamingo is mostly confined to the alkaline saline lakes of the Rift Valley of Tanzania, Kenya and Ethiopia, where numbers are thought to have approached four million individuals in the recent past (Mlingwa & Baker 2006). The size of range, total number of sites used, access and difficulties of accurate census preclude detailed analysis, not least because the birds breed in different areas in different seasons (Tuite 1979, 2000). Nevertheless, at peak aggregations, it seems likely that the vast majority of the population aggregates onto 10 major sites in the Rift Valley, and it seems likely that these large aggregations include large numbers of breeders when conditions are favourable. Breeding has only been confirmed from Lake Natron in this region of Africa (Childress et al 2007), so although the species is known to show considerable movements throughout the course of a year (Childress et al 2006), it seems that this population may qualify for inclusion in Table 1, Column B Category 2a of the Action Plan.

Moulting:

The north-western European population of the Shelduck *Tadorna tadorna*: approximately 70% of the whole population flies to a common moult site in the outer Elbe river mouth in the central part of the German Wadden Sea (Blew & Südbeck 2005), and most of the remaining part of the population moults in a few other sites in the international Wadden Sea. With the current population size of 300,000 birds (Wetlands International 2006), it is considered that this population would qualify for inclusion in Table 1, Column B Category 2a of the Action Plan.

Post-moult:

Not aware of any populations/sites which may qualify as an example for this phase of the annual cycle.

Autumn stop-over(s):

The East Canadian High Arctic breeding population of Light-bellied Brent Geese *Branta bernicla hrota*: O'Briain & Healy (1991) estimated that up to 75% of this population stage at Strangford Lough in Northern Ireland, UK, in late October and early November, and one might anticipate that an even higher proportion pass through the site before spreading out to several smaller wintering sites on Ireland, in Wales, on the Channel Islands and on Brittany, northern France. Outside Strangford only a few sites at the same time of the year holds internationally important numbers (Robinson et al. 2004). With the current population size of 26,400 birds (Wetlands International 2006), it is considered that this population would qualify for inclusion in Table 1, Column A Category 3a of the Action Plan.

Wintering:

The Svalbard-breeding population of the Barnacle Goose *Branta leucopsis* winters almost exclusively on the Solway Firth in south-west Scotland (Owen & Black 1999). The recovery of this population from c.300 individuals in the late 1940s to 23,900 in winter 2005-2006 (Musgrove et al. 2007) represents a remarkable conservation success story and underlines the importance of site safeguard and sympathetic management where global populations show such highly restricted wintering distributions. Although small numbers winter away from the Solway and several thousand occur at loch of Strathbeg in eastern Scotland on migration, it is considered that this population would qualify for inclusion in Table 1, Column A, Category 3a of the Action Plan

Spring stop-over(s):

The NE Canada & Greenland/West Europe population of Red Knot *Calidris canutus islandica* migrates from the Wash and other staging areas on the British Isles and in the Dutch-German-Danish Wadden Sea in late April to spring stop-over areas found in north Norway and western Iceland, and they stage on mudflats found in these regions to refuel in order to finalise their spring migration to breeding areas in north Greenland and northeast Canada (Davidson & Wilson 1992). Three sites, Porsangerfjord and Balsfjord in Norway, and Breidafjordur on Iceland, together holds approx. 65% of the population, and only a 3-4 other sites in Iceland holds higher numbers (Gudmundsson and Gardarsson 1993, Davidson & Piersma in press). With the current population size of 450,000 birds (Wetlands International 2006), it is considered that this population would qualify for inclusion in Table 1, Column B Category 2a of the Action Plan.

Pre-breeding:

Not aware of any populations/sites which may qualify as an example for this phase of the annual cycle.

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Guidance for interpretation of the criterion “dependence [*of a waterbird population*] on a habitat type which is under severe threat”

Definition

Severe threats to species’ habitats are those which result in changes to a large proportion of habitat, especially where those changes are irreversible (or where the changes are only reversible over very long time-scales),

and

where such changes will or are likely to negatively impact species’ populations that are ecologically dependent on those habitats.

Guidance for the application of this definition

The application of this criterion is especially to be considered when species have a specialised ecology and/or behaviour that link them to particular habitats at any stage of their life cycles.

Example of the application of this definition

Dark-bellied Brent Geese *Branta bernicla bernicla* depending on Common Eelgrass *Zostera marina* in the White Sea

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This paper gives the background and gives an example of a flyway population which is considered to be at risk as a result of dependence on a habitat type which is under severe threat, i.e. qualifies to be listed in Column A Category 3b (for populations numbering 25,000-100,000 individuals) or Column B Category 2b (for populations numbering more than 100,000 individuals) of Table 1 in the AEWA Action Plan.

The subtidal Common Eelgrass *Zostera marina* beds and the Brent Goose together represents the classical example of a habitat-waterbird interaction in which disappearance of the former has major and negative impacts on the latter, and is mentioned in many books introducing estuarine or avian ecology to graduate students at universities worldwide.

The interaction was first noticed following the outbreak of the ‘wasting disease’ in the 1930s, the *Labyrinthula* slime-mould disease which wiped out *Zostera marina* beds on most major staging sites for Brent Geese on both sides of the North Atlantic. This, probably in combination with occasional incidents of over-harvesting in several countries along more flyways in the 1940s-1960s, led to massive declines in three populations of *Branta bernicla hrota* and the *Branta bernicla bernicla* population (Cottam & Munro 1954, Salomonsen 1958, Madsen 1987, Nowak 1995).

The disappearance of the *Zostera marina* beds in north-western Europe and along the USA Atlantic coast did not leave the sites used by the Brent Geese completely void of suitable habitats and food, but the loss of an important major habitat nevertheless caused Brent Goose numbers to dwindle. Brent Geese switched to feeding on alternative food resources, such as *Zostera angustifolia* and *Z. noltii* (e.g. Ranwell & Downing 1959, Charman 1979), sea lettuce *Ulva lactuca* (Smith et al. 1985) and *Enteromorpha* spp. (Ranwell & Downing 1959), or to feeding on salt marshes (Christiansen 1936, Mörzer Bruins & Tanis 1955), a habitat that previously had only been used under extreme high water level conditions caused by winter storms.

Since the 1930s *Zostera marina* has gradually recovered in some sites and countries, but has never recovered in other sites and countries. The latter is considered to be primarily caused by increased problems with eutrophication caused by nutrient surplus originating from human household waste water and/or excess nutrient loads in runoff waters from agricultural areas in the estuarine catchments (e.g. Phillippart 1994, van Katwijk 2000). In some sites *Zostera marina* probably did not recover because the disappearance of the plant itself changed sedimentation processes in some bays and estuaries. The silty-sandy sediments suitable for *Zostera marina* were therefore replaced by sandy-stony sediments and the latter was populated by *Fucus vesiculosus/serrator* and other algae associated with stones on shallow waters (Rasmussen 1977).

The recovery process of *Zostera marina* even in sites with suitable sediments is generally very slow, as evidenced from a very detailed Ph.D. study of population processes of the species in Limfjorden, Denmark (Olesen 1993). This study found that successful establishment of new *Zostera marina* beds rarely happens by spread of seeds, hence – whenever *Zostera marina* beds are damaged or destroyed by winter storms or eutrophication, recovery primarily has to come from gradual growth of remaining patches of *Zostera marina* which grows by side-branching of existing *Zostera* shoots, but this process is however very slow, and the radius of such a patch will only grow by 16 cm per year (Olesen & Sand-Jensen 1994). Additionally this process will only happen when eutrophication levels are suitably low to allow sufficient light to pass through the water column above the *Zostera marina* bed.

If eutrophication levels are high unicellular algae and filamentous algae populations flourish and take the largest share of light, reducing *Zostera* growth potential (e.g. Borum 1985) or in the worst case even eradicating the *Zostera*. Well-documented cases of the latter and with severe negative impacts on Brent Goose numbers are given by Clausen & Percival (1998), the worst case with a complete loss of 12 km² *Zostera marina* bed in Nissum Fjord lead to a 70% decline in Brent Goose numbers on the site during the 1980s (Clausen *et al.* 1998). Neither *Zostera* nor Brent Goose numbers have recovered at that site by 2008 (Denny *et al.* 2004 and P. Clausen unpublished data).

In most sites of Western Europe and Eastern USA where *Zostera* was lost, Brent Geese numbers have recovered, if not to the high historical numbers found before the wasting disease, at least to levels 4-fold or more higher than those known from immediately after the wasting disease/over-harvesting period of the 1930s-1960s, This recovery has partly been possible because Brent Geese have adapted to new habitats, and now feed in intertidal *Zostera/Ulva/Enteromorpha* in autumn and winter (e.g. Summers 1990a), since the 1970s also on agricultural areas (pastures, cereal fields and oil-seed rape fields) in winter (e.g. Summers 1990b, Summers & Critchley 1990, McKay *et al.* 1993), and on saltmarshes and pastures in spring (e.g. Boudewijn 1984).

The White Sea in this respect represents a special case. Dark-bellied Brent Geese on migration from Western Europe to Siberia stops here in late May-early June. If *Zostera* disappears from the White Sea, they have no alternatives. At the sites where the ecology of the Brent Geese in the White Sea has been studied all Brent Geese mainly fed on subtidal *Zostera marina* during low tides, and roosted without feeding at high tide (Clausen 1997; Syroechkovsky & Litvin 1998). A few salt-marshes which could act as alternative feeding sites are found on the sites, but by no means marshes capable of harbouring the up to 27,000 Brent Geese recorded in the most important site Sukhoye More (Clausen 1997), because of the marshes small size, but in particular because vegetation growth had hardly begun at the time the sites are used by Brent Geese.

Without this stop-over where the Brent Geese refuel their fat and protein-reserves, the Brent Geese would probably not be able to breed in Siberia (cf. Ebbinge & Spaans 1995) - ‘probably’ referring to a possible option that they could move on to sub-arctic saltmarshes north of the White Sea on the Kanin Peninsula, where they are known also to stop (as revealed by satellite telemetry; Green *et al.* 2002) and by field observations (Rudi Drent & co-workers, unpubl. data).

The White Sea is a fairly large sea, but with few sufficiently shallow and suitable sites for *Zostera* and hence Brent Geese. It has an enormous catchment, including the 744 km river Northern Dvina. At present (in the mid 1990s, when the Brent Geese were studied) there are no obvious signs of eutrophication threats to the White Sea, but such issues are foreseeable here as well as anywhere else, where high populated areas (in the case of the White Sea in particular Archangelsk) are adjacent to wetlands with seagrass beds. Lessons

learned from Western Europe and Eastern USA (e.g. Chesapeake Bay) are: when eutrophication problems eventually reach levels where they impact submerged vegetation reversal of this inappropriate situation for the wetlands, their vegetation and associated waterbirds is a lengthy process.

In several studies from Danish and Dutch estuaries, lagoons and lakes, it has taken well over 25 years to recover vegetation – and in some sites in Denmark this period of time has not even been sufficient e.g. Ringkøbing Fjord (cf. Kiørboe 1980, Petersen *et al.* 2008) and Nissum Fjord (mentioned above).

Brent Goose has a generation length of approx. 8-12 years. Hence disappearance of a vital food resource like *Zostera* in the White Sea would potentially affect at least 2-3 and probably more generations. This in combination with the above assessment forms the basis for the judgment of the Technical Committee of AEWa to consider this as an example of a flyway population being dependent on a habitat which is under severe threat.

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