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Interim report of the Intersessional Working Group on Impact on Bat Populations of the Use of Antiparasitic Drugs for Livestock

1. Background

The dung produced by livestock supports a diverse community of invertebrates, some of which are of conservation interest in their own right, and many of which provide an important food source for other animals, including bats. The degree to which bats rely on dung fauna varies among species and possibly through the range of individual species, but some species in some areas are highly reliant on such insects.

A range of drugs is administered to livestock to control parasites. These drugs vary in persistence and there are variations in the timing and method of application. Of particular concern are avermectins, the collective term for the active ingredients in a range of such animal health products. After application, residues of the chemicals may be excreted from the animal through its dung. Exposure to these residues can adversely affect dung insects through direct killing of adult insects or their larvae, or through impairing the reproduction of the associated insects.

Through its Conservation and Management Plan, Eurobats identified that 'the impact of pesticides such as antiparasitic drugs should be carefully assessed and the appropriate advice given to land managers to avoid possible deleterious effects on bats'. This was agreed at its first, second and fourth Meeting of Parties [MoP1 (Annex K (CMP), para 23), MoP 2.14 (Annex A, para 23) and MoP 4 (Record, Annex 12a, para 6b)].

An Intersessional Working Group (IWG) was formed by the Eurobats' Advisory Committee (Lithuania 2004) to investigate the impact on bat populations of the use of antiparasitic drugs (endectocides) for livestock, in conjunction with any work being carried out under the Bern Convention. The IWG has met at AC11 (Slovakia, 2005), AC12 (Luxembourg, 2006) and MoP5 (Slovenia, 2006). At Mop5 it was agreed that a final report would be made available to MoP 6 (?2010).

The main agreed activities of the group were

1) to establish current practices throughout Europe via a questionnaire,

2) to carry out a literature review,

3) to identify the bat species most likely to be affected by the use of these drugs,

4) to identify any international initiatives or the presence of wider conservation concerns about the use of these drugs,

5) to identify any future action that Eurobats should pursue regarding the effect on bats of the use of these drugs.

The group continues to discuss the impact on bats of such drugs and the position and activities that it would be appropriate for Eurobats to adopt.

2. Questionnaire

In trying to establish the scale of use of such antiparasitic drugs around Europe a questionnaire produced by the group was circulated by the Secretariat to all range states. A copy of the questionnaire and covering note are presented in Annex A.

Responses were received from 16 range state. These are Albania, Czech Republic, Denmark, Estonia, Finland, Georgia, Germany, Ireland, Italy, Latvia, Lithuania, Portugal, Romania, Slovak Republic, Ukraine, United Kingdom.

Although this is one third of the countries circulated, it gives a good geographical spread from Ireland and Portugal in the west to Georgia in the east, and from Finland in the north to Albania and Italy in the south.

The questionnaire asked for information on the following issues:

Questions 1 and 2 asked for the name of the responding country and the compiler of the response.

Q.3. Are antiparasitic drugs used for livestock in your country?

Every responding country reported that such drugs are used in its country. In one country (Georgia) such use is compulsory, in 11 countries they are used routinely and widely, in four countries (possibly seven) they are only used in special circumstances.

Q.4. What active ingredients are approved for use?

The responses demonstrated a huge range of materials with a mixture of active ingredients and product names offered. Some respondees appended printed lists of products and/or ingredients. If further analysis of this is required it will need the services of somebody with better experience of these products and ingredients.

Q.5. What kind of animals are treated?

In order of frequency the following animals were identified:

Cattle (14), horses (10), sheep (8), pigs (8), goats (2), donkeys (2), reindeer (1).

Not strictly in the nature of the ‘livestock’ under consideration, responses also included dogs (3), cats (3), poultry (2), ‘birds’ (1) and macaques (Gibraltar).

Responses with respect to the age of animals treated were not clear, but it is thought that the majority of treatments are for young animals.

Q.6. How is the drug administered?

Drugs are administered by mouth by bolus (6), tablet (7), liquid (7), gel (8); by injection (12); and externally by spray (7), dip (5), pour-on (7).

Note that drugs administered by bolus are the most long-lived and hence widely regarded as having the most serious impact on dung fauna.

Q.7. At what time of year?

Drugs were administered at all time of year with peaks in spring and autumn:

Jan (3), Feb (3), **Mar** (**5**)**, Apr** (**10**), May (3), Jun (4), Jul (4), Aug (3), **Sep** (**7**), **Oct** (**9**), Nov (3), Dec (3).

Q.8. How often is the drug administered?

Annually (2), c.1.5 per year (3), twice per year (4).

Q.9. Are the animals indoors or outdoors when treated?

Indoors (13), outdoors (9).

Q.10. Does any national legislation/regulation or official guidelines apply to the use of such drugs?

Applicable legislation or regulation or guidelines was reported for six countries, but none reported that no such legislation/regulation existed.

Q.11. Is there any policy relating to their use in nature reserves?

No range state reported specific measures for nature reserves, nine states reported that no such guidance existed.

Q.12. Can you identify any alternative treatments that are effective?

Three states wrote that they were aware of no alternatives to treatment, five offered alternatives that included pasture rotation, biocontrol, targeted treatment to limit resistance, hygiene, breeding, vaccines, ‘management’.

Q.13. Is there any recent research (since 2000) carried out in your country?

No country reported recent research in its country relating to the affects on wildlife (five reported about research on other aspects, such as resistance), and four countries reported that there had been none. It is known that there has been recent research on impacts on wildlife in UK.

Q.14. Are there special problems in acquiring information about the drugs used and their application in your country?

The topic involves a wide range of bodies and scattered sources of information. Seven countries reported difficulties in obtaining data from their various departments, but it is considered likely that most did, and that the difficulties were probably responsible for a number of other countries not responding.

Q.15. Any further comments?

Some of the comment included here is incorporated elsewhere above. One country reported that although treatment was compulsory, there was no financial assistance to animal keepers; this may affect the actual level of treatment implemented, but may also affect the control of application.

Many range states have had considerable difficulty in obtaining information on the drugs used in their country and in the methods of application. A small number of states do not use such drugs, either for reasons of cost or for difficulties of control. Where they are used the main problem is a bewildering range of products used on a wide range of animals and via a wide range of methods of application. It would seem that practices vary widely geographically.

3. Bat species most likely to be affected

Comparing bat dietary studies with information on dung fauna, an account of the bat species most likely to be affected by the impact of drugs on their insect prey has been compiled and is presented in Annex 2.

This document is still being refined and range states are asked to seek and contribute further information from their own countries.

4. Possible mechanisms to reduce impact

With respect to mechanism to relieve impact, further investigation of measures identified in Question 12 of the above questionnaire (re alternative treatments – see results in Section 2 above) could be carried out.

In general, treatment should be timed to cause minimum impact and avoid use of products more toxic to dung fauna.

In general, application by bolus should be avoided. Sustained-release ivermectin bolus can cause risks for Diptera (especially Muscidae and Scathophagidae) for up to four months after application. Impacts are less on adult scarabaeid beetles, but increased in larvae; larvae of *Onthophagus*, *Euoniticellus*, *Copris*, *Onites* and *Aphodius* may be affected for more than 140 days (Lumaret, pers.comm.).

Moxidectin is identified as a product similar to ivermectin, but having almost no effect on Diptera and Coleoptera. On the other hand, Dochlorvos, mainly applied to horses, is particularly dangerous with the main period of impact for the first ten days after application (Lumaret, pers.comm.)

Where animals can be kept indoors for about two weeks after treatment (as is common particularly in northern latitudes) most problems can be avoided. At least some beetle species will avoid dung of treated animals, so where untreated dung is within range of the beetles, the beetles will be able to maintain themselves. Problems may be particularly acute where treatment is applied over a wide area at the same time and where treatments cannot be applied while animals are kept indoors (and this may be particularly applicable to Mediterranean countries).

Also see recommendations of RSPB document (Webb et al. 2006):

- Treating livestock only when necessary and avoiding treatment of older animals if they are not susceptible to the parasite of concern;

- Grazing avermectin-treated livestock in fields close to others containing untreated animals;

- Treating livestock with any appropriate non-avermectin product or moxidectin (a less toxic avermectin);

- Altering (if relevant from an animal health perspective) the timing of avermectin treatment in the spring (to change the period when residues in the dung coincide with key foraging periods of the vertebrates);

- Restricting the use of products containing doramectin, ivemectin or eprinomectin to housing of the livestock or in the autumn (when the main dung insect breeding season is over).

Also Ransome 1996, e.g. keep stock dung free of avermectins within the home range of young bats (e.g. 0.5-1.5km) of key species, such as horseshoe bats.

Also as far as possible do not treat grazing animals in nature reserves with more toxic products.

5. Recommended research priorities

Investigation of any relevant differences in diet through the geographical range of key species.

Assessment of levels of bat activity in relation to use of drugs in areas with a mosaic of drug use and non-use.

Decomposition rates of treated dung by insects with respect to the different methods of application.

[to be extended!]

6. Bibliography

There is a very extensive literature on the subject of antiparasitic drugs and their impact. A provisional bibliography is offered at Annex 3.

[to be completed]

7. Related international initiatives and other wider conservation concerns

Although the Bern Convention had discussed the issue in 1998 and considered draft recommendations of a group of experts, there has been no follow-up through the convention. These discussions can be found in T-PVS (98) 18: pp. 83-86, Annexe 5, *Presentation relative a l'usage des endectocides et leur effets sur l'entomofaune* (by Mr le professeur Jean-Pierre Lumaret, Universite Paul Valery Montpellier, France); p. 87, Annexe 6, *Draft recommendation of the Group of Experts on the consequences of the use of endectocides on non-targeted invertebrates*).

A new European Directive proposes that each new product must be tested for its impacts on dung fauna (Directive 93/40/CEE of the Council of 14 June 1993 changing the Directives 81/851/CEE and 81/852/CEE relating to the legislations of the member states regarding veterinarian medication - ?new). No other such international initiative has been identified.

National concerns amongst conservation organisations with a remit for other groups of animals or plants or for wider conservation have been varied (see discussion below). The European Invertebrate Survey has not been involved in this issue to date.

In the UK, both the Royal Society for the Protection of Birds (RSPB) and Buglife – The Invertebrate Conservation Trust have expressed particular concern about the widespread use of such drugs. A recent PhD, carried out with part-funding from the RSPB, suggested that because of the way the drugs were used there was not a major issue in the area studied and that the impact could be reduced by appropriate timing and methods of application and animal husbandry. This study related to one product in one area. There are a few other recent or current studies in UK (e.g. Norfolk Wildlife Trust). Nothing is yet published from these studies (but see Webb et al. 2006). The UK government has recently suspended the licence for the use of cypermethrin in sheep dip through concerns for run off affecting aquatic invertebrates. English Nature has published a case study of the effects of such drugs on the greater horseshoe bat (*Rhinolophus ferrumequinum*).

8. General results to date

9. Proposed future activities for Eurobats

There needs to be further discussion, including a meeting of the IWG during AC12 in Budapest, to organise completion of this report within a given timescale, and to decide on the possible role of Eurobats in developing practice that would reduce any threat that these drugs place on bat populations. An alternative is that Eurobats may be able to input into wider concerns.

Parties should:

[to be discussed]

The Eurobats Secretariat should:

[to be discussed]

10. References cited in this report

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11. Composition of IWG

The following delegates have been registered as members of the group as at AC11 (Luxembourg, May 2006):

Tony Hutson - UK (Convenor)
Stefania Biscardi – Italy
Aurora Dibra – Albania
Marie-Jo Dubourg-Savage – France
Jane Goodwin - UK
Christine Harbusch – Germany
Anna Nele Herdina – Austria
Peter Lina – Netherlands
Kaja Lotman – Estonia
Katie Parsons – UK
Jacques Pir – Luxembourg
Paul Racey - UK
Roger Ransome – UK
Dino Scaravelli – Italy
Laurent Schley - Luxembourg
Abigel Szodoray-Paradi – Romania
Libuse Vlasakova – Czech Republic

A.M.Hutson
Convenor
May 2007

Annex A. Questionnaire and background information circulated.

1. Background information

Impact on bat populations of the use of antiparasitic drugs for livestock

Through its Conservation and Management Plan, Eurobats identified that 'the impact of pesticides such as antiparasitic drugs should be carefully assessed and the appropriate advice given to land managers to avoid possible deleterious effects on bats'. This was agreed at its first, second and fourth Meeting of Parties [MoP1 (Annex K (CMP), para 23), MoP 2.14 (Annex A, para 23) and MoP 4 (Record, Annex 12a, para 6b)].

An Intersessional Working Group (IWG) was formed by the Eurobats' Advisory Committee (Lithuania 2004) to investigate the impact on bat populations of the use of antiparasitic drugs (endectocides) for livestock, in conjunction with work being carried out under the Bern Convention.

These drugs are used for the control of external and internal parasites of a wide range of domesticated farm animals. Concern has been raised that the drugs persist into the faeces of the livestock and affect the normal insect dung fauna which is an important element of the diet of a number of species of bat.

It is the intention of the IWG to produce a report in 2006 for the next Eurobats' Advisory Committee meeting and its 5th Session of the Meeting of the Parties.

We attach a brief questionnaire asking about the use of such drugs in your country and should be most grateful if you would complete this questionnaire and return it to the Eurobats Secretariat by the end of November 2005.

2. Contents of questionnaire on the use of antiparasitic drugs for livestock

1. Country of response

2. Compiler of response (name and address)

3. Are antiparasitic drugs used for livestock in your country?
   Yes No
   Compulsorily
   Routinely and widely?
   Only in special circumstances? Specify

4. What active ingredients are approved for use?

5. What kind of animals are treated?
   Species:
   Age:

6. How is the drug administered?
   By mouth : * bolus * tablet * liquid * gel
   By injection
   By external application: *pour-on (drench) * spray * dip

7. At what time of year?

8. How often is the drug administered

9. Are the animals indoors or outside when treated?
    * Indoors * Outside

10. Does any national legislation/regulation apply to the use of such drugs?
    Name of legislation/regulation:
    Brief statement of scope of legislation/regulation:

11. Is there any policy relating to their use in nature reserves?

12. Can you identify any alternative treatments that are effective?

13. Is there any recent research (since 2000) carried out in your country?
    References (including reports):

14. Please identify if there are special problems in acquiring information about the drugs used and their application in your country.

15. Further comments

Please complete and return this form to the Eurobats Secretariat by 10 November 2005.

Annex 2. Bat species most likely to be affected by impact of drugs on insect prey

Compiled by Christine Harbusch

1. Insects occurring commonly in herbivore dung (according to Strong 1992, Lumaret 1996, Skidmore 1991):

Coleoptera: Scarabaeidae: ***Aphodius*** (especially *rufipes*), *Onthophagus*, *Copris*, *Onitis*

Geotrupidae: ***Geotrupes*** spp.

Diptera: **Nematocera**: **Anisopodidae**, Sciaridae, Psychodidae, Trichoceridae, (plus some important species in Ceratopogonidae, Chironomidae, Bibionidae, Scatopsidae, Tipulidae)

Brachycera: (some important species in Stratiomyidae, Asilidae, Empididae, Dolichopodidae, Syrphidae)

Cyclorrhapha : Sepsidae, Sphaeroceridae, **Scathophagidae** (*Scathophaga*), Muscidae (*Musca* spp.), Fanniidae (*Fannia*), Calliphoridae **(***Calliphora*, *Lucilia*), Anthomyiidae.

2. Bat species likely to be affected by the use of antiparasitic drugs in livestock on pasture:

Species	**Insect prey taxa**	**References**
Rhinolophus ferrumequinum	Aphodius, Geotrupes, Scathophagidae, Muscidae	Beck 1995, Beck et al 1997, Gloor et al 1995, Ransome 1996, Roué & Barataud 1999, Vaughan 1997, Duvergé & Jones 1994
R. hipposideros	Diptera (Muscidae, Sphaeroceridae, Scathophagidae), Coleoptera (Scarabaeidae)	Roer & Schober 2001, Roué & Barataud 1999, Vaughan 1997, McAney & Fairley 1989
R. mehelyi	Scarabaeidae, Muscidae	Sharifi & Hemmati 2001
Eptesicus nilssonii	Scarabaeidae, Aphodius	Rydell 1986, Gerell, R. & J. Rydell 2001
E. serotinus	Aphodius, Geotrupes Calliphoridae, Sciaridae, Muscidae	Beck 1995, Catto 1994, Gerber et al. 1996, Harbusch 2003, Kervyn 2001, Vaughan 1997
Myotis blythii	Scarabaeidae	Roué & Barataud 1999
M. brandtii	Scathophagidae, Scarabaeidae	Berge 2007
M. daubentonii	Calliphoridae, Muscidae	Sullivan et al., 1993
M. emarginatus	Brachycera, Coleoptera (sp.?)	Topál 2001, Roué & Barataud 1999
M. myotis	Scarabaeidae, Aphodius, Geotrupes	Güttinger et al. 2001, Roué & Barataud 1999, Pereira et al. 2002, Kerwyn 1996

M. mystacinus	Nematocera, Cyclorrhapha	Tupinier & Aellen 2001, Berge 2007, Vaughan 1997, Taake 1992, 1993
M. nattereri	Scarabaeoidea, Aphodius Sarcophagidae, Sciaridae, Calliphoridae, Muscidae, Fanniidae, Sarcophagidae, Sciaridae	Bauerova & Cerveny 1986, Baagoe 2001, Gregor & Bauerova 1987, Shiel et al. 1991
M. punicus	Scarabaeidae (sp.?)	Topál & Ruedi 2001
M. schreibersii	Brachycera (spp.?)	Roué & Barataud 1999
Nyctalus leisleri	Aphodius, Scathophaga stercoraria Scarabaeoidea, Muscidae, Calliphoridae	Bogdanowicz & Ruprecht 2004 Sullivan et al., 1993
N. noctula	Aphodius, Geotrupes Sciaridae	Beck 1995, Vaughan 1997
Pipistrellus pipistrellus	Muscidae Scatopsidae, **Scatophagidae**	Schober & Grimmberger 1998 Swift et al., 1985, Barlow 1997
P.pygmaeus	Scatophagidae	Barlow 1997
Plecotus auritus	(Scarabaeidae) Calliphoridae, Sciaridae	Beck 1995, Vaughan 1997, Shiel et al. 1991,
Plecotus austriacus	Aphodius	Beck 1995
Vespertilio murinus	Scarabaeidae	Rydell, 1992

Bold : bat species with regular and important use of relevant prey item
normal : species consumes taxa irregularly or only in few numbers; or insect species/family was not defined

3. Bat species less likely to be affected

Bat species	**Diet less affected**	**Diet not affected**	**no information**	**reference**
R.aegyptiacus	n/a			
R. euryale			X?	
R. blasii			X?	
B. barbastellus		X		?
B. leucomelas			X	
E. bottae			X	
Hypsugo savii			X	
M. alcathoe			X	
M. aurascens			X	
M. bechsteinii		X		?
M. brandtii	X			
M. capaccinii		X		?
M. dasycneme		X		?
M. daubentonii	X			

M. emarginatus	X			
M. hajastanicus			X	
M. nipalensis			X	
M. schaubi			X	
M. schreibersii				
N. azoreum			X	
N. lasiopterus		X		Uhrin et al. 2006
P. kuhlii		X		?
P. nathusii		X		?
P. pygmaeus	X			
P. maderensis			X	
Pl. auritus	X			
Pl. austriacus	X			
Pl. kolombatovici			X	
Pl. macrobullaris			X	
Pl. sardus			X	
Pl. teneriffae			X	
T. teniotis		X		Rydell & Arlettaz, 1994
T. nudiventris			X	
Vespertilio murinus	X			

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