

Consideration of nectarivorous birds in wildlife risk assessments

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1 – Introduction



Green-throated carib *Eulampis holosericeus* and hibiscus flower, Guadeloupe

In subtropical and tropical climate zones where crops exhibit a flowering phase before harvest, nectar-feeding birds (see table) may be attracted to crop flower nectar. We present points to consider on whether and how a nectarivorous avian scenario might be included in higher tier environmental risk assessment (ERA) for plant protection products (PPPs) and what data would be needed.

2 - Nectarivore birds

Nectar-feeding is widespread among birds, but almost no species consumes nectar exclusively. Most combine it with arthropods and other diet types for a mixed diet at least within parts of the year.

Twelve families of birds contain more or less specialized nectarivores (Bezzel and Prinzing 1990). Of particular interest are three families: hummingbirds (Trochilidae), sunbirds (Nectariniidae) and honeyeaters (Meliphagidae), which mainly drink nectar, and thereby collect pollen (Campbell and Lack 1985, Lovette and Fitzpatrick 2016).

Nectarivores have adapted to permit a nectar-central diet, showing higher activity of digestive enzymes, which break down sugars, higher rates of absorption of sugars, and altered kidney function. They in parts also have specialized bill and tongue morphology (Bezzel and Prinzing 1990). To maintain specialized and highly energy-demanding hovering flight, species must rapidly excrete much of the water content of the nectar it consumes.

3 - ERA for nectarivores in attractive flowering crops?



Purple-throated carib *Eulampis jugularis* and banana flower, Martinique

Nectarivores are attracted by colorful flowers and may feed on these if the anatomy of their bill and tongue as well as flower characteristics enable them to do so (ornithophily - bird pollination), but also non-specialized species visit flowers and mandibulate and even destroy flowers to get nectar (Rocca and Sazima 2008), and several nectarivorous birds species are known to visit crops that flower before harvest, like banana, among other species (Wilsey and Temple 2011).

For avian ERAs on the basis of EFSA (2009) an estimated exposure - residues in relevant food items - is compared to a toxicity endpoint from lab studies. Where further refinement on country level or for a specific crop is deemed necessary, a higher tiered approach could consider relevant focal species (including species-specific overall diet and body weight) to calculate an appropriate and realistic burden of active substance residues.

In nectarivore-attracting crops, where risk assessment can be performed for a nectar-feeding species, refined exposure estimates *inter alia* need to be considered crop-specific nectar composition and sugar content (e.g. given by Chalcoff et al. 2006 and references therein) and the energetic expenditure for the nectar feeding bird species.

4 – Conclusions and appeal for contribution

To investigate relevance and potential risk of nectarivores in flowering crops treated with PPPs, an extensive evaluation of literature and bird monitoring data are needed on

- whether nectar-feeders spend time in which crop fields (considering their relationship to floral abundance and morphology of flowering crops)
- the extent they feed on specific flowering crops throughout the flowering periods
- the energetic demands and expenditures of the respective species

However, also species not showing specific adaptations (bill or tongue) may need to be considered (see Table for species not belonging to the main nectarivore species) to evaluate whether the scenario is covered by the existing exposure scenarios or not.

Bird Family	Distribution	Diet
Hummingbirds (Trochilidae)	New World	90% nectar, 10% small arthropods
Woodpeckers (Picidae)	Worldwide	Occasionally nectar, mainly insects, fruits
Parrots (Psittacidae)	Tropics, SE-Asia, Australasia	Lories specialized brush-tipped tongue for nectar-feeding
New Zealand Wrens (Acanthisittidae)	New Zealand	Supplementary (when insects scarce)
Asities (Philepittidae)	Madagascar	Genus Neodrepanis primarily nectarivore, otherwise supplementary
Australasian Tree-creepers (Climacteridae)	Australasia	Insectivores, sometimes nectar
Honeyeaters (Meliphagidae)	Australasia	Specialized nectarivores, but also invertebrates
Thornbills (Acanthizidae)	Australasia	Insectivores, sometimes nectar
Stichbird (Notiomystidae)	New Zealand	Nectarivore, but also fruits, invertebrates and others
Longbills (Melanocharitidae)	New Guinea	Nectar and insects
Penduline-tits (Remizidae)	North America, Eurasia, Africa	Supplementary (when insects scarce)
Cisticolas (Cisticolidae)	Europe, Africa, S-Asia, Australasia	Insectivores, some also take nectar, but rarely
Bulbuls (Pycnonotidae)	Africa, South Asia	Omnivores, but nectar is taken
Warblers (Sylviidae)	Old World	Primarily insectivore, some occasionally take nectar
White-eyes and Yuhinas (Zosteropidae)	Africa, SE-Asia, Australasia	Mostly insects, but nectar important when insects scarce
Tree Babblers (Timaliidae)	S- and SE Asia	Mostly insects, but also nectar when insects scarce
Laughing-thrushes (Leiothrichidae)	Africa, Asia	In addition to insects, Leiothrix and Turdoides species also consume nectar
Starlings (Sturnidae)	Old World	Omnivores, including nectar
Sugarbirds (Promeropidae)	S-Africa	Primarily nectar, also insects
Fairy-bluebirds (Irenidae)	SE-Asia	Primarily frugivorous, occasionally and regionally nectar
Leafbirds (Chloropseidae)	SE-Asia	Predominantly insects and fruits, some nectar
Flowerpeckers (Dicaeidae)	SE-Asia, Australasia	Primarily fruits and nectar
Sunbirds and Spider-hunters (Nectariniidae)	Africa, S-Asia, Australasia	Primarily insectivorous, but rely heavily on nectar
Weavers (Ploceidae)	Africa, SE-Asia	Mainly seeds and insects, nectar at times
Waxbills (Estrildidae)	Africa, SE-Asia, Australasia	Primarily seeds, nectar taken by some species
Hawaiian Honeycreepers (Fringillidae)	Hawaii	Some species are specialized on nectar
New World Blackbirds (Icteridae)	New World	Omnivores, including nectar
New World Warblers (Parulidae)	New World	Primarily insectivorous, some species feed heavily on nectar in non-breeding season
Tanagers (Thraupidae)	S-America	Pure nectarivores & omnivores, including nectar



Lesser double-collared sunbird *Cinnyris chalybeus* and Protea flower, South Africa