#CAP4NATURE.

Insects
(terrestrial; including insect pollinators)

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1. Status

- **Insects** are the **most abundant and species rich** group of organisms on the planet

- Insects provide a whole host of **ecosystem services** to the environment and to agriculture including **pollination, natural pest control, decomposition and nutrient cycling**, as well as many others. These services are estimated to be worth billions of dollars per year

  (e.g. IPBES pollination assessment, Losey & Vaughan (2006) Bioscience, Stout (2019) Pollival)

- **Many insect groups** are **threatened in Ireland**. For example, 1/3 Irish bee species, 18% butterflies and 17% dragonflies and damselfies are threatened with extinction

  (e.g. Fitzpatrick et al. (2006) Regional Red List, Regan et al. (2010) Irish Red List no. 4, Nelson et al. (2011) Irish Red List no. 6)

- While there are Red Lists for some groups of Irish insects, **we do not know much** about others and there is no existing red-list status for many key groups

- There is **only one legally protected insect in Ireland**, the Marsh Fritillary butterfly, which is protected under Annexe 2 of the Habitats Directive. Its status is "**inadequate**". No other insect species are afforded legal protection in Ireland

  (NPWS, 2019)

2. Trends

- **Declines** in insect biomass and numbers have been recorded **over time** internationally

  (e.g. Hallman et al. 2017 Plos One, Shorthall et al. (2009) Ins. Cons. Div, Leather et al. (2018) Ann Appl Biol)

- **Declines in wild bees and butterflies** over time have been recorded globally

  (e.g. Grixti et al. (2009) Biological Conservation, Biesmeijer et al. (2006) Science, Carvalheiro et al. (2013) Ecology Letters, Ollerton et al. (2014) Science, UK Butterfly Monitoring Scheme)

- Westward shift in rare **bumblebees** in Ireland **(decreased range**)

  (Fitzpatrick et al. (2007) Biological Conservation)

- Abundance **bumblebees** in Ireland have **declined** 3.7% per year over last 6 years, and abundance of **butterflies** in Ireland have **declined** 2.6% per year over last 10 years

  (http://www.biodiversityireland.ie/press-release-citizen-science-key-to-tracking-insect-declines-in-ireland/ & http://www.biodiversityireland.ie/press-release-citizen-science-key-to-tracking-insect-declines-in-ireland/)

3. Drivers/Pressures

- Habitat loss & fragmentation
- Pesticide use and other sources of pollution
- Pathogens and disease
- Invasive species
- Climate change

(e.g. Sanchez-Bayo et al. (2019) Biological Conservation, Habel et al. (2019) Biodiv. & Cons., Biodiversity and Conservation, Goulson et al. (2015) Science, Potts et al. (2010) TREE, IPBES Pollination Assessment)

4. Solutions

- Maintaining and conserving insects on farmland can ensure functioning ecosystems, and can also have direct benefits for agricultural production (**ecological intensification**)
  (e.g. Kremen & Merlender (2018) Science, Bommarco et al. (2013), TREE, IPBES Pollination Assessment)

- Semi-natural habitat on farmland is important for insects including **hedgerows, field margins, road verges, semi-natural grasslands, trees and woodland, wetlands, ponds, peatlands** etc.
  (e.g. Cole et al. (2002) Ag, Eco & Env, Cole et al. (2017) Ag, Eco & Env, Byrne et al. (2019) Basic & Applied Ecology, Alison et al. (2013) Biol. Cons., All Ireland Pollinator Plan Farmland Guidelines, Merckx et al. (2012) J App Ecol, Froidevaux et al. (2019) Ag. Eco. Env), Staley et al. (2016) Ag., Eco., Env.)
  - **Retain existing habitats**
  - **Enhance quality of habitats**
  - **Create new habitats**
  - All Ireland Pollinator Plan provides farmland guidelines on what can be done for pollinators on farms (www.pollinators.ie). Many of these measures will also benefit other insect groups

- Control invasive species, prevent spread of disease
  (e.g. Furst et al. (2014) Nature)

- **Reduce** or eliminate use of **pesticides** and other pollutants
  (e.g. O'Hea et al. (2010) Ins. Cons. Div., Power & Stout (2011) J App Ecol, Desneux et al. (2007) Ann Rev Ent, Pisa et al. (2017) Environ Sci Pollut Res Int., Godfray et al. (2015) Proc. B., All Ireland Pollinator Plan Farmland Guidelines)

- **Diversified agricultural systems** rather than monocultures are beneficial for insects, and more varied, complex landscapes are more beneficial than simple ones
  (e.g. Stanley et al. (2013) J App Ecol, IPBES Pollination Assessment, Tscharntke et al. (2005) Ecology Letters, Persson et al. (2013) Ag Eco Env, Schirmel et al. (2018) Ag Eco Env, Power (2016) Ins Cons Div)