European Pollinator Initiative (EPI)

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Overview

Context/problem to be solved

- Several studies point to local declines of pollinators and loss of pollination services in Europe and the problems are perceived to be much more widespread.
- Many scientists, governments and NGO's are working to conserve, manage and promote pollinators and the services they provide, however, there is relatively little interaction between theses groups at the continental-level.
- Research activities relating to pollinators and pollination are often undertaken in more than location in Europe and there is sometimes competition rather than complementation.
- Knowledge transfer within Europe is sometimes hindered by language, political and administrative barriers.
- There are a number of key gaps in our knowledge regarding pollination.
- The full potential for conserving and sustainably managing pollinators for maximum societal benefit in Europe is far from being met at present.

Objectives

- The European Pollinator Initiative mission statement is: ***To protect and enhance the biodiversity and economic value of pollinators throughout Europe***.
- The EPI aims to integrate and co-ordinate local, national and international activities relating to pollination into a cohesive network in order to safeguard the services provided by pollinators across the continent.
- More detail is available at www.EuropeanPollinatorInitiative.org

Approach

- An interim steering committee has been established to guide the initial development of the EPI.
- Europe has been partitioned into 16 regions and each has a representative whom is responsible for co-ordinating local activities. These representatives are informing potentially interested parties in their region and also feeding back information on local issues and concerns relating to pollination.
- In the short-term a centralised expertise database is being constructed.
- Longer term activities are covered by the EPI 'Plan of Action'.

Application of the ecosystem approach

The aims of the EPI incorporate to varying degrees all the principles of the ecosystem approach, and clearly recognises:

- Both the economic and intrinsic biodiversity value of pollinators to society.
- An integrated landscape approach to managing natural and habitats and agro-ecosystems is necessary to maximize benefits from pollination services.
- Activities should include all relevant sectors of society, draw upon a range of scientific disciplines and include local knowledge.
- Management must be targeted at the appropriate spatial and temporal scales.

Lessons learnt

There are a number of high quality activities being undertaken throughout Europe to conserve and protect pollinators and the services they provide. However, the overall benefits to society can be greatly enhanced by coordinating and facilitating these activities at the trans-national level. The EPI aims to harness the existing expertise to enhance the value of pollinators across all sectors of European society.

I. Background/Problem statement:

Pollinators are essential for production in many crops of economic importance; the maintenance of biodiversity in the environment; and also have aesthetic appeal to people. Europe has a wide variety of insect pollinators including honeybees (*Apis mellifera*), bumblebees, solitary bees, butterflies, and some beetles and flies. Honeybees, some bumblebees and solitary bees, are actively managed, however, the many 100's of other pollinating insects species are 'wild' and not managed. Many of Europe's key pollinators and the services they provide are under increasing threat from a variety of human-related disturbances, such as habitat loss, pesticides, diseases and parasites, climate change, invasive plants and competition with non-native pollinators.

Economic value of pollinators

It is estimated that more than 150 (84%) of European crops are directly dependent upon insects for their pollination (Williams 1994). European crops for which the number of fruits and seeds and their quality are dependent upon, or enhanced by, insect pollination include (Corbet et al. 1991, Williams 1996):

- Fruits – apple, orange, tomato, pear, peach, melons, lemon, strawberry, raspberry, plum, apricot, cherry, kiwifruit, and currants
- Vegetables – carrot, potato, onion, pepper, pumpkin, field bean, French bean, eggplant, squash, cucumber, and soy bean
- Seeds and nuts – sunflower, almond, walnut and chestnut
- Herbs – basil, sage, rosemary, thyme, coriander, cumin and dill
- Industrial crops – cotton, oilseed rape, white mustard, and buckwheat
- Fodder crops for animals – alfalfa, clover and sweetclover
- Essential oils – chamomile, lavender, and evening primrose

Crop pollination by honeybees alone is estimated to be worth €4.25 billion per year in Europe (Borneck & Merle 1989). Honeybees have declined significantly across Europe in recent decades due to diseases such as *Varroa* and tracheal mites, and these declines are predicted to persist (Williams 1996). Between 1992 and 2002, hive numbers have decreased in: Austria (13%), Germany (11%), France (10%) and Ireland (9%) (www.beekeeping.com/databases/europe_92_96.htm). Dependence upon a single pollinator for crop production can be a risky strategy and many other pollinator species are known to provide excellent pollination services. Honeybee derived products like honey and wax also have an important economic value. Annually 130,000 tonnes of honey are produced in the EU (http://europa.eu.int/comm/agriculture/agrista/2003/table_en/index.htm).

Bumblebees are important pollinators of several European crops and together with other non-honeybee pollinators are estimated to provide services worth more than €750 million per year (Borneck & Merle 1989). Bumblebees can be managed specifically to pollinate some crops such as field beans, tomato and melon; or more often 'wild' unmanaged populations provide the service to these crops and others e.g. red clover. The best pollinators of many orchard fruits are solitary bees like the red mason bee. The production of apples and almonds may be greatly enhanced by introducing managed solitary bees (Bosch 1994).

Biodiversity value of pollinators

To maintain the biodiversity of Europe's natural areas it is essential to protect our pollinators. More than 90% of wild flowers rely upon pollinators for their reproduction (Costanza et al. 1997). Floral diversity is strongly associated with pollinator diversity (Potts et al. 2003a). Pollinators are key elements in food webs; wild flowers provide food for many animals in the form of vegetation, fruit, berries and nuts. Adequate pollination is therefore essential to ensure the survival of animals and birds which feed upon these wild plants.
There are more than 2,300 species of bee in Europe and some of these species have markedly declined in abundance recently (Day 1991). Knock-on effects to the flowers they pollinate and animals associated with these flowers is not fully known, but the consequences for biodiversity are likely to be negative (Buchmann & Nabhan 1996).

The wonderful variety of flowering plants and the insects associated with them have an important role in providing quality environments for sociey. Some of Europe's most highly valued natural areas are so visually pleasing because they contain diverse communities of flowers and pollinators. Our domestic gardens and parks also rely on effective pollination to ensure they provide surroundings that people can enjoy. Without looking after our pollinators we cannot look after these aesthetically appealing areas.

Threats to European Pollinators

Threats to pollinators and the services they provide are perceived to be increasing around the world and are largely man-made in origin (Kearns et al. 1998). Declines in pollinators have reported in several regions of Europe (Williams 1986; Rasmont 1988; Westrich 1989; Corbet et al. 1991; Osborne et al. 1991; Day 1991; Falk 1991; O'Toole 1994; Banazak 1995; Williams 1996) and several drivers of pollinator loss have been identified:

(1) Habitat Loss. The habitats required by many pollinators are being lost through changing land use practices such as agricultural intensification (Osborne et al. 1991; Banazak 1995). Pollinators require a range of resources from their environment for foraging, nesting and reproduction. The loss of any one of these requirements can cause pollinators to become locally extinct (Westrich 1989). Habitats can also become fragmented and habitat patches isolated, so that pollination services are less effective (Jennersten 1988; Steffan-Dewenter & Tscharntke 1999).

(2) Agrochemicals. Excessive use or inappropriate application of pesticides is known to have negative impacts on a range of pollinators (Batra 1981; Kevan 1975; O'Toole 1993).

(3) Parasites and Diseases. European honeybees have suffered dramatic declines following the rapid spread of *Varroa* and tracheal mites (Williams et al. 1991; Watanabe 1994); this continues as resistance to chemical control agents is increasing, and beekeeping is now also potentially at risk from the spread of the small hive beetle (Evans et al. 2003). Bumblebees too can suffer from the spread of parasites (Schmid-Hempel 1991).

(4) Fire and Overgrazing. Changing fire and grazing regimes are putting increased pressure on many plant-pollinator communities, especially around the Mediterranean. More frequent fires (Potts et al. 2003b) and excessive grazing (Kreuss & Tscharntke 2002) can lead to habitats supporting fewer pollinators.

(5) Competition. Native or 'wild' pollinators can compete with managed species for floral resources (Steffan-Dewenter & Tscharntke 2000; Thomson 2004; Butz-Huryn 1997). Introducing large numbers of managed pollinators may have negative effects on local native species and knock-on effects on the plants they would normally pollinate.

(6) Climate change. As climate changes, the habitats suitable for supporting pollinators may change with some areas being lost and others being newly created. When a habitat disappears, or the pollinator is unable to move to a new habitat, then local extinction can occur (Travis 2003; Hill et al. 2002). Climate change may also disrupt the synchrony between the flowering period of plants and the activity season of pollinators (Price & Waser 1998; Wall et al. 2003).

(7) Introduction of non-native plants. Introducing exotic plant species can have a negative impact on some pollinators. For instance, if the invading plant species comes to dominate a floral community, but does not provide the native pollinators with the resources they require, then these flower visitors will decline if no alternate resources are available (Chittka, L. & Schürkens 2001; Brown et al. 2002).

II. Objectives/Purpose of the Activities:

Overall Objective

To protect and enhance the biodiversity and economic value of pollinators throughout Europe. The EPI aims to integrate and co-ordinate local, national and international activities relating to pollination into a cohesive network in order to safeguard the services provided by pollinators across the continent.

The Plan of Action contains four elements:

(1) Assessment – quantifying the loss of pollinators in Europe and the risks associated with the loss of pollination services.

- Assess declines in pollinators and the services they provide across Europe
- Determine the economic value of pollinators for key crops
- Establish the conservation status of Europe's pollinators
- Identify the drivers of pollinator loss

These assessment objectives are already being pursued through the ALARM project (http://www.alarm-project.ufz.de/) and national activities in other countries including Italy and Ireland.

(2) Adaptive management – Identifying the best management practices and technologies to overcome declines in pollinators and the services they provide.

- Facilitate new research collaborations to secure funding for strategic research
- Identify and promote best land-use and conservation practices to restore and protect pollinator communities
- Secure pollination services to European crops by developing sustainable pollinator management

- Develop alternate species of pollinator for management

(3) Capacity Building – Build and strengthen alliances and expertise in Europe to increase the benefits from pollination.

- Coordinate existing activities to maximise effectiveness
- Build European taxonomic capacity for pollinators
- Construct effective networks to exchange information on pollination
- Train the next generation of researchers and taxonomists

(4) Mainstreaming – Supporting national plans for the conservation and sustainable use pollinators, and increasing the awareness of governments, industry and the public.

- Provide the relevant science to underpin policy development
- Advise policy makers on pollinator issues
- Introduce awareness of pollinators in to education
- Educate land managers, farmers and conservationists

III. Details of the case study and the approach taken:

Background

The International Convention on Biological Diversity (www.biodiv.org/programmes/areas/agro/pollinators.asp) specifically cites pollination as a key ecosystem function that is threatened globally. The São Paulo Declaration on Pollinators (www.biodiv.org/doc/ref/agr-pollinator-rpt.pdf), based on the available global evidence at the time, reported that 'the numbers of honeybee colonies have decreased dramatically' and 'the numbers of native bees are dwindling, some species seriously so'. The stated plan of action of the CBD International Pollinator Initiative is to:

- Monitor pollinator decline, its causes and its impact on pollination services;
- Assess the economic value of pollination and the economic impact of the decline of pollination services;
- Address the lack of taxonomic information on pollinators;
- Promote the conservation and the restoration and sustainable use of pollinator diversity in agricultural and related ecosystems.

These global objectives are equally relevant at the European level and reflect concerns about pollinator loss and associated risks in Europe. In 2000, at the VIII International Pollination Symposium in Hungary, a group of pollination researchers came together to form the European Pollination Initiative.

Organisation

The European Pollinator Initiative has an 'Interim Steering Committee' which is facilitating the development of the network. A number of 'Regional Contacts' have been established, to coordinate local interests and link them to regional activities (Figure 1). A database of expertise is being collected on a regional basis and compiled centrally. The aim being to facilitate links between experts in different fields and provide a look-up service for those people seeking specific advice or skilled input.

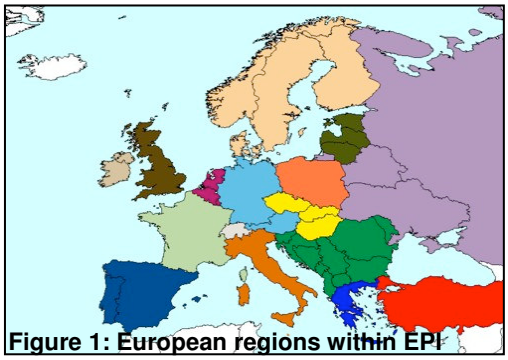

Figure 1: European regions within EPI

As the European Pollinator Initiative continues to grow, a key step in its development is identifying the expertise and interests which already exist across Europe. The aim is to bring together interested parties for collaborative projects and co-ordinated actions, and also to draw upon experience to guide the future direction of the EPI. An ongoing activity is the formation of a range of 'Working Groups' to focus on specific issues.

V. Analysis:

Application of the ecosystem approach

The broad range of activities under the European Pollinator Initiative umbrella includes many aspects of the ecosystem approach. Indeed, Decision V/6 has been used as an important guide for developing ideas and approaches within the EPI. References to the various principles discussed below will use European Agri-environmental schemes as one example of EPI activities.

Principle	Example of relevant EPI activity
1	EPI considers pollinators to have economic, biodiversity and aesthetic value which will relate to different sectors of society. The demands and expectations of these different groups are the recognised drivers for how we should manage our pollinators.
2	'Top down' and 'bottom up' approaches to managing ecosystems for pollinators are viewed as being complementary. For instance, EPI encourages and supports the adoption of wide-ranging agri-environmental schemes across Europe with broad centrally defined criteria set by the EU, while recognizing that these schemes need to be tailored and targeted at the national and local level in order to maximize effectiveness. Development of new management techniques relies heavily on farmers guidance as to what is practically achievable and acceptable.
3	Research by several partners within the EPI view the landscape context of the areas being managed for pollinators (natural habitats or farms) as being just as important as the within area land use for the conservation and sustainable use of pollinators.
4	EPI supports the adoption of agri-environmental schemes throughout Europe whereby farmers are viewed as guardians of the landscape and should be paid for providing services to biodiversity (including pollinators) by governments. Science underpinning these schemes being developed by EPI members always aims to reconcile the production value needs with those of the conservation of pollinators.
5	EPI clearly recognises that ecosystem function in the long-term relies on an integrated approach to conservation and management. Agri-environmental schemes may not only aim to enhance pollinator diversity but are targeted to benefit farmland biodiversity in general including plants, birds and other invertebrates.
7	Research activities of some EPI members address biodiversity at multiple spatial and temporal scales and in some cases aim to identify the appropriate scales at which drivers of pollinator diversity act. Farm-scale management is nested within the landscape and the most widespread benefits arise from agri-environmental schemes adopted by the majority of farms within a country (e.g. Entry Level Scheme in UK). EPI aims to contribute to both the underpinning science and policy uptake of these practices.
8	Effectiveness of agri-environmental schemes relies on managing new (e.g. buffer strips) and existing habitats (hedgerows) in such a way that they can provide long term benefits (up to 10 years or more).
9	EPI considers that change is inevitable in the European landscape and aims to ensure that research addresses systems as being dynamic and where possible tries to influence future change in a way which is beneficial to pollinators and the services they provide. New agri-environmental practices will be required and future scenarios are important in directing research.
10	A key concept adopted by EPI is that the often conflicting requirements of land use (agricultural production vs. conservation of pollinator biodiversity) must be reconciled if agri-environmental schemes are to be effective and accepted by different sectors of society.

12 EPI has a fully inclusive approach to the problems of managing European pollinators; all sectors of society are invited and actively encouraged to contribute to the knowledge base which will help direct and focus activities to enhance societal benefits from pollinators.

Relevance to the operational objectives of the Plan of Action of the IPI

All the main objectives of the IPI are included within the EPI but applied at a European rather than global level. See section on EPI Plan of Action for full details.

V. Conclusions.

The European Pollinator Initiative is in its early stages of development and is aimed at being a long-term element of European society. The success to date has relied largely on the 'in kind' contributions of its participants which has established a solid base for the EPI. The challenge now is to develop the EPI in a way to achieve a critical mass which can more effectively promote and enhance activities at a trans-national level. The major limitation to achieving this is the current lack of core funding to provide a dedicated team of workers to actively develop the EPI. The continued success of the EPI is expected, but the rate of future progress is likely to be limited by the finite resources current participants are able to contribute to the process.

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