The importance of taxonomy to ecosystem services and human wellbeing

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Outline of talk

Global context
Threats to plant diversity
Why plant diversity is important
Food
Energy
Water
Health
Conclusions
No part of the planet is unaffected by man’s activities

Between one third and one half of the land surface has been transformed by human action

More than half of all accessible fresh water is used by humanity

Threats to plant diversity: land use change

- One fifth of the world’s tropical forests were destroyed between 1960 and 1990.
- Current deforestation rates are estimated at 13 million hectares per year.
- In Africa 28 trees are felled for every tree that is planted.

Deforestation accounts for 20% of global carbon emissions.
Doubling of atmospheric CO$_2$ concentrations expected to occur in the next 100 years.

Food security is threatened by shifting growing zones, CO$_2$, rainfall and temperature effects.

Invasive species, pests and diseases are emerging

Agriculture, horticulture and forestry will be fundamentally affected, and new species and varieties will need to be utilised
Threats to plant diversity

- 60,000 to 100,000 plant species are currently threatened with extinction.
- For plants, the current extinction rate is 100 times the background rate.

www.millenniumassessment.org
Why plant diversity is important: ecosystem services

Provisioning services
Food, medicine, fuel, construction, clothing, etc.

Regulating services
Climate moderation, disease regulation, flood regulation

Supporting services
Soil formation, nutrient cycling, primary production.

Cultural services
Spiritual, recreational, aesthetic, inspirational, educational

All life depends on plants
Why plant diversity is important: adaptation

Globally, 80% of our plant-based calorie intake comes from just 12 domesticated plant species, 8 cereals and 4 tubers.

An estimated 30,000 species of plant are edible.

Can we continue to rely on such a tiny fraction of edible plant diversity for all our future needs?
Why plant diversity is important: adaptation

75% of the world’s population relies on traditional medicines. Traditional Chinese Medicine uses 10,000 plant species. 7,000 species are used for medicine in India.

Given their importance to human health, can we continue to ignore the conservation and potential for use of these species?
Why plant diversity is important:

**adaptation**

<table>
<thead>
<tr>
<th>APG Order: Evolutionary sequence, oldest at right. Log no.species in Order</th>
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</thead>
<tbody>
<tr>
<td>Percentage of genus level variation used in COMPLETE SEPASAL livelihoods</td>
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<tr>
<td>Percentage of genus level variation used for FOOD in SEPASAL livelihoods</td>
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<tr>
<td>Percentage of genus level variation covered by ITPGRFA Appendix 1</td>
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India
Population today: 1.17 billion
Population growth rate: 1.548%
Population in 2050: 1.5-1.7 billion

The problem: to find food for an extra 500 million people against a background of diminishing plant diversity, less land, less water and climate change.
Since 1960, India has tripled food production; 30% of that increase has been due to increased land under agriculture but most is due to the development of new and improved crop varieties.

Crop wild relatives are an essential resource for breeding, conferring disease resistance, drought tolerance etc.
In a study of 12 wild *Lactuca* species accessions in seed banks in Europe and the USA, half of the species were wrongly identified.

Finding the next biofuel crop that will thrive in drylands

The MSB routinely screens its collections for oil content and quality. See:

http://www.kew.org/data/sid

Ca. 175 species of *Jatropha*
Ecosystems services & human wellbeing: energy

MSBP Botswana programme

43 target taxa (rare, threatened and useful)

6 taxa had unresolved taxonomic problems (parallel taxonomies or lost types)

4 taxa were regarded as either common or rare depending on taxonomy adopted.
Restoration of catchment forests cannot be achieved with monocultures because they are vulnerable to disease, pests, extreme weather events and climate change.

More complex ecosystems need to be constructed or put back in order to ensure resilience.
Ecosystems services & human wellbeing:

water
Ecosystems services & human wellbeing:

water
There are ca. 60,000 trees species in the world, and foresters have detailed knowledge of only about 100.

**Taxonomy** provides the **stable framework** for the development of knowledge about those remaining 59,900 species to which information on **traits** and **use** can be added.
Ecosystems services & human wellbeing: water and forests

550 species of rattans

Annual trade US$6.5 billion

Vernacular names applied inconsistently.

Taxonomy underpins knowledge on distribution, status, characteristics, value, silviculture and trade.

*Calamus caesius* in Philippines misidentified as *C. spinifolius.*

Ecosystems services & human wellbeing: health

imprecise vernacular name

misspelt Latin scientific name: unknown entity

correct TCM plant species; but author missing

imprecise vernacular name

misspelt Latin scientific name; author missing

corrupted Latin scientific name: probably refers to the red roots of *Paeonia lactiflora* Pall.

animal ingredient (now illegal in UK)

imprecise vernacular name

imprecise & misspelt vernacular name
Ecosystems services & human wellbeing:

Consequences of misuse of scientific names:

• **National poisons networks** fail to identify all adverse reactions for a species since records at different clinics use different names for the same plant.

• **Companies** miss commercial opportunities through failing to access published research by not knowing all names ever used for that plant.

• **Health regulators** assign inconsistent control procedures for a medicinal plant by listing it under more than one name.

• **Custom officers** fail to implement trade regulations if obscure synonyms are used by unscrupulous importers.
Conclusions

Attention Dog Guardians
Pick up after your dogs. Thank you.

Attention Dogs
Grrrrr, bark, woof. Good dog.

District of North Vancouver.
Bylaw 5981-11(i)