Economic value of biodiversity in the UK

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What is the meaning of "Economic Value"?

- Direct: utility impacts
- People care about biodiversity (BD) *per se,* or about species/habitats that constitute it
- use versus non-use values for species/habitats
- not necessarily a market value, but still an economic value

Economic value (2)

- *Indirect* values: role of BD in supporting production systems eg agriculture
- role in production of new pharmaceuticals
- ecosystem services
- role of BD in maintaining Holling-type resilience of system - link to sustainability

- all of these count in present and in future

Means of estimating economic values of BD

For indirect values, link aspects of BD to market values via a "production function"

e.g.: di Falco and Perrings (2003): higher diversity in crop genetics increases farm incomes and reduces variability of incomes for Southern Italian farmers, 1970-1993.

Could also link diversity to development of new pharmaceuticals in this way (and has been)

- But much harder (impossible?) to estimate value of BD to resilience and therefore to sustainability at the macro level

Estimating direct values

- Involves estimating utility value of BD - much harder in some senses, since involves mostly non-market values
- revealed (RP) and stated preference (SP) approaches
- RP: look at behavioural trails. Eg random utility travel cost model: link species diversity to recreation behaviour

- Example could be diversity of fish species and anglers choice of sites. Travel costs incurred tells us something about utility derived
- could estimate $v = f(TC, S)$, where v are visits, TC are travel costs and S is a simple species count; and where v, TC, S, vary across sites
- this kind of work has been done both in US and UK and often shows positive relationship between v and S….. This enables us to estimate the "user value" of changes in S.

Stated preference approaches

- Useful where no “behavioural trail” exists
- behaviour in constructed markets
- main options: contingent valuation and choice experiments

- contingent valuation: WTP for changes in S, or changes in particular habitats, species
- very widely used worldwide, although most applications to BD have been to species/habitats, rather than BD itself
- choice experiments: people express choices over different combinations of species/habitat conservation, defined in terms of their attributes, and the cost of conservation
- much less used to date than contingent valuation

examples

- Landscape features of ESAs eg Breadalbane, the Machair in W.Isles
- conservation of the Flow country; scottish heather moorland; dorset heathland; caledonian pineforest
- conservation/introduction of red kites, wild geese, beavers, wolves
- ecosystem quality for rivers under WFD

Example 1:

Values of biodiversity for UK public forests

(source: Willis KJ et al "The Social and Environmental Benefits of Forests in Great Britain". Report to the Forestry Commission, 2003)

Relative biodiversity values for different types of forest in the UK

Biodiversity forest type	Relative value for existing area	Relative value for an increase of 12,000 ha.	Relative WTP values per household for an increase of 12,000 ha.
Upland Conifer Forest (control)	1.00	1.00	1.00
Lowland Conifer Forest	1.00	1.08	0.94
Lowland Ancient Semi-Natural Broadleaved Forest	1.74	2.15	3.23
Lowland New Broadleaved Native Forest	1.63	3.92	2.40
Upland Native Broadleaved Woods	2.32	3.31	2.57
Upland New Native Broadleaved Woods	1.95	3.15	1.74

Example 2: Choice experiment results for Breadalbane ESA

(Hanley et al, *Journal of Agricultural Economics, 1998)*

Attribute	*linear model, parameter value (t stat)*	*quadratic model, parameter value (t stat)*	*implied ranking, both models*	*stated ranking*	*'marginal' WTP, quadratic model*
woods	0.575 (16.0)	0.576 (16.0)	1	1	£50.46
archaeology	0.075 (2.2)	0.076 (2.2)	5	5	£6.65
heather moors	0.260 (7.5)	0.262 (7.6)	2	2	£22.95
wet grasslands	0.236 (6.8)	0.238 (6.9)	3	3	£20.85
dry stone walls	0.128 (3.8)	0.129 (3.8)	4	4	£11.30
tax	-0.007 (-8.223)	-0.0137 (4.3)			
tax^2	-	0.000038 (2.2)			
n	1480	1480			
Log L (max)	-1281.564	-1279.199			
Log L (0)	-1625.946	-1625.946			

Example 3: Conservation of wild geese in Scotland: choice experiment results

(Hanley et al, *Animal Conservation*, 2003)

Which species are protected

All geese species

Endangered species only

Means of control

Habitat management

Habitat management plus shooting

Location

Special reserves only

All sites in Scotland

Population change over next 10 years

Low fall (10%)

Stay the same as current

Low rise (10%)

Moderate rise (25%

High rise

Cost of the policy to household (per hsld. per year over next 10 years)

£1, £5, £10, £20, £35, £60

An Example Choice Experiment **Please consider the following options:**	
Policy A Species protected by policy: **Endangered species only** Means of control: **Habitat management & Shooting** Location: **Special reserves only** Population change over 10 years: **Stay the same** Price per year to you over the next ten years in extra taxes: **£10**	**Policy B** Species protected by policy: **Endangered species only** Means of control: **Habitat management & Shooting** Location: **All sites in Scotland** Population change over 10 years: **Moderate rise (25%)** Price per year to you over the next ten years in extra taxes: **£60**

Response:

I would choose Policy A _____

I would choose Policy B _____

I would choose neither Policy A nor Policy B _____

Estimate probabilistic choice models from such choices using multi-nomial logit models. Results:

- The different attributes of goose conservation policy are valued differently by the various groups studied. For instance, the general public and visitors were both WTP for a policy to stop shooting: this was not true for residents.
- Which species are conserved, and where they are conserved, also had different effects on preferences.
- Finally, whilst no evidence could be found for economic benefits (= popular support) from big increases in geese numbers, results suggested that small increases (or at least no losses) would be positively valued.

New work on economic value of BD

- Undertaken for Defra, focussing on BD on farmland in England
- using choice experiments mainly
- team comprises ecologists and economists
- focusses on “attributes” of biodiversity, trying to combine those which ecologists think are important, with those policy-makers are interested in, with those the general public can understand

- Case study areas: Cambridgeshire and Northumberland
- survey carried out on members of the general public in these areas

Aspects of biodiversity included in design

- Familiar species of wildlife
- Rare (unfamiliar) species of wildlife
- Habitats
- Ecosystem services

A: Familiar Species of wildlife

. . . any bird, mammal, reptile or plant that is likely to be recognised by members of the general public.

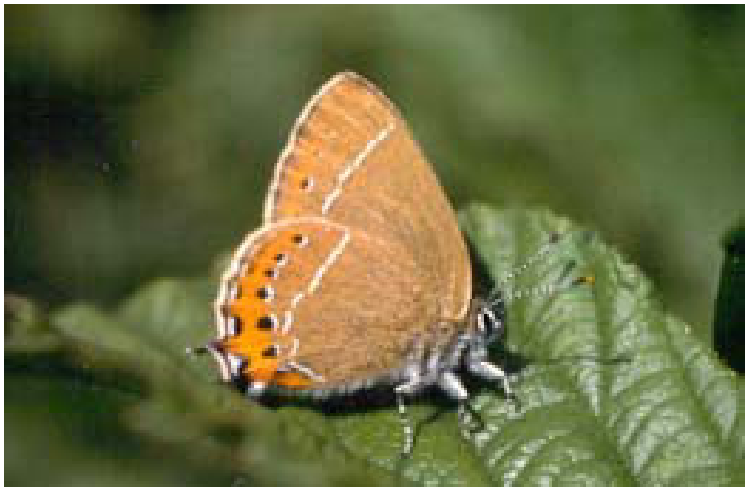
Common familiar species :
- Squirrel
- Kestrel
- Blue tit
- Poppies

Rare familiar species :
- Otter
- Brown Hare
- Skylark
- Song thrush

B: Rare (unfamiliar) species of wildlife

… any species of wildlife that:

- has officially been designated as being rare or endangered,
- but which members of the general public are unlikely to know about.
- Can be just as important as familiar species
- Examples include:
  - Pasque flower
  - Bearded stonewort
  - Long horn beetle
  - Black hairstreak butterfly



What will happen if we do nothing?

- Populations of some familiar species will continue to decline.
- Populations of some rare species will continue to decline potentially leading to local extinction.
- The area of semi-natural habitats are likely to be further reduced + the quality of remaining habitat is likely to decline.
- Ecosystem services will continue to be threatened.

- People are told that policies can be brought in to protect BD, but that (I) these will be costly and (ii) we might want to selective in how we target them. They are then asked:

Which aspects of Cambridgeshire's biodiversity would you like to see being protected?

Before we get them into a choice experiment

Example of biodiversity policy choice option

	POLICY OPTION A	POLICY OPTION B	DO NOTHING (Biodiversity degradation will continue)
Familiar species of wildlife	Rare familiar species protected	Both rare and common familiar species protected.	Continued decline in the populations of familiar species
Rare, unfamiliar species of wildlife	Recovery of rare species to non-threatened status	Slow down the decline in the populations of rare unfamiliar species	Continued decline in the populations of rare, unfamiliar species
Habitat quality	Habitat restoration	Habitat restoration	Wildlife habitats will continue to be degraded and lost
Ecosystem process	Continued decline in the functioning of ecosystem processes	A reduced risk that ecosystem processes that affect humans fail	Continued decline in the functioning of ecosystem processes
Annual tax increase	£80 annual increase in your tax bill for 5 years	£20 annual increase in your tax bill for 5 years	No increase in your tax bill

Choice **A** **B** **Do nothing**

Conclusions

- Economic values *can* thus be estimated for changes in biodiversity. Do we want to, though?
- Yes, if we wish to compare the benefits of BD conservation with the costs; or with alternative uses of this money (new schools, better health care..); or even if we just wish to include *quantified* public opinion in designing BD policy
- But the researcher faces big challenges in doing so, one of the main ones being public lack of knowledge in what BD is and why it matters.