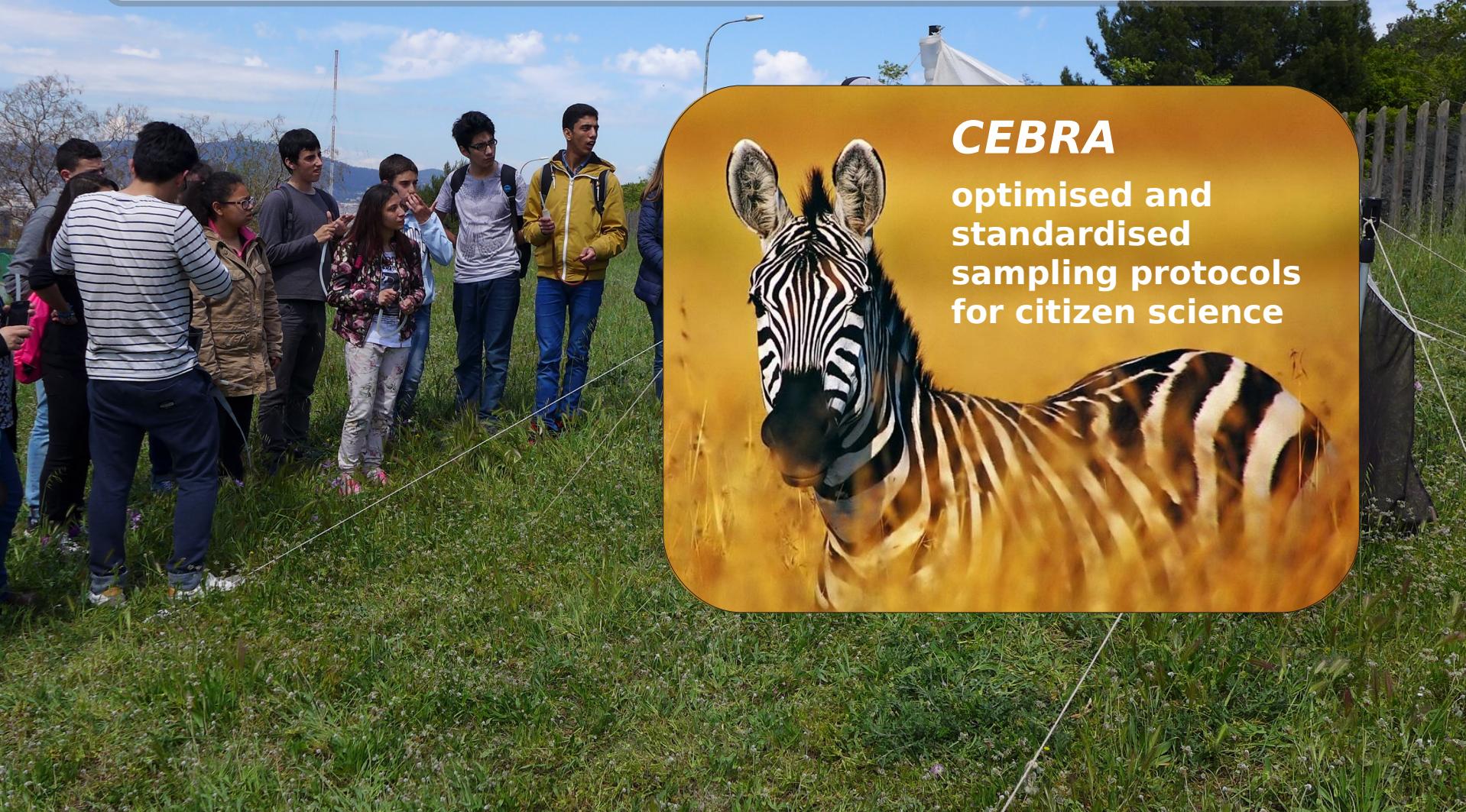


Are we making the most of BioBlitz?



Are we making the most of BioBlitz?



CEBRA
optimised and
standardised
sampling protocols
for citizen science

Big data / local data/ citizen science data



Big data / local data/ citizen science data



The central part of the slide features a world map with a network of teal-colored dots and lines representing data connections. Overlaid on this are three main informational blocks:

- Journal Cover:** A thumbnail for the journal *Conservation Biology*, labeled as a "Contributed Paper". It includes a red play button icon and the text "ANNUAL REVIEWS Further Click here for quick links to Annual Reviews content online, including: • Other articles in this volume • Cross-linked articles".
- Academic Article 1:** "Big data and the future of ecology" by Stephanie E Hampton^{1*}, Carly A Strasser², Joshua J Tewksbury³, Wendy K Gram⁴, Amber E Budden⁵. It is categorized under "CONCEPTS AND QUESTIONS".
- Academic Article 2:** "Citizen Science as an Ecological Research Tool: Challenges and Benefits" by Inson,^{1,2} Benjamin Zuckerberg,¹ Bonter.¹

Big data / local data/ citizen science data

How good?
How appropriate?
Evaluable?

CONCEPTS AND QUESTIONS.
Big data and the future of ecology
Stephanie E Hampton^{1*}, Carly A Strasser², Joshua J Tewksbury³, Wendy K Gram⁴, Amber E Budden⁵,

ANNUAL REVIEWS Further
Click here for quick links to Annual Reviews content online, including:
• Other articles in this volume
• Cross-linked articles

Conservation Biology

Contributed Paper

Evaluating environmental education, citizen science, and stewardship through naturalist programs

Adina M. Merenlender,^{*} Alycia W. Crall,[†] Sabrina Drill,[‡] Michelle Prysby,[‡] and Heidi Ballard[§]



Big data / local data

Science?
Monitoring?
Management?



CONCEPTS AND QUESTIONS.

Big data and the future of ecology

Stephanie E Hampton^{1*}, Carly A Strasser², Joshua J Tewksbury³, Wendy K Gram⁴, Amber E Budden⁵,

Citizen Science as an Ecological Research Tool: Challenges and Benefits

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BioBlitz



- **Citizen-science** event to **record** species in an area
- Scientists, naturalists and volunteers participate
- Main objectives:
 1. **Scientific**: Species records
 2. **Educational**: Public awareness of biodiversity



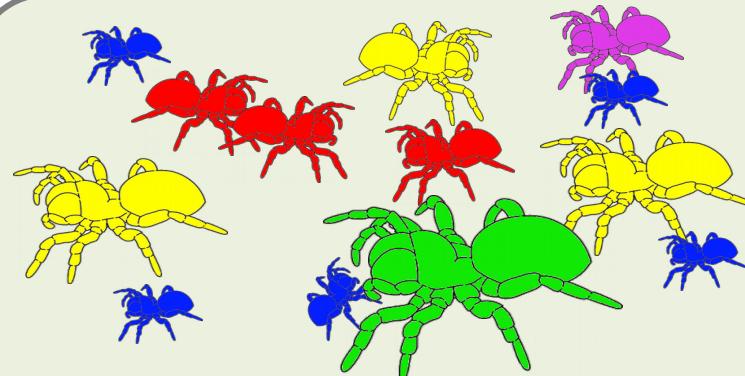
Limitations

- **Abundance**
- **Comparability**
- **Efficiency**

Limitations

- **Abundance**
- **Comparability**
- **Efficiency**

- Species dominance
- Habitat preference
- Functionality
- Interactions
- Spatio-temporal changes
- Anthropogenic impacts



Limitations

- **Abundance**
- **Comparability**
- **Efficiency**



Limitations

- **Abundance**
- **Comparability**
- **Efficiency**

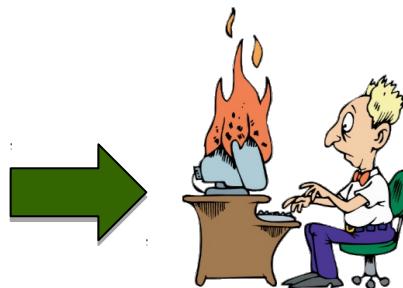
- Collectors
- Time
- Space
- Detectability
- Target taxa
- Expertise
- ...



Limitations

- Abundance
- Comparability
- Efficiency

- Collectors
- Time
- Space
- Detectability
- Target taxa
- Expertise
- ...

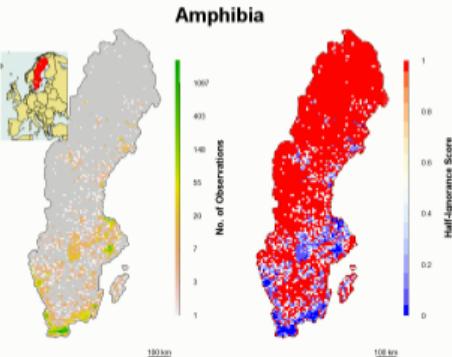


$$\log(\sigma_{j,t}) = u_j + \phi_j + v_{j,t} + \alpha_j x_{j,t},$$

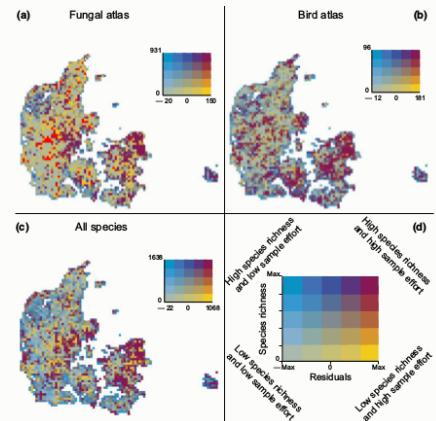
for $j = 1, 2; i = 1, \dots, n; t = 1, \dots, T,$

$$\mu_{j,i} | \mu_{j,-i}, \tau_{j,j}^2 \sim N$$
$$c_{j,i} | \mu_{j,-i}, \tau_{j,j}^2 \sim \dots$$

$s \in V_j$



Presence/ absence



Mair et al 2016; Geldmann et al. 2016

Limitations

- Abundance
- Comparability
- Efficiency



How much more should I beat...?

How many species of arthropods? Erwin's estimate revised

FRODE

REPORTS

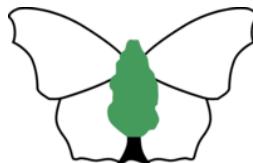
Arthropod Diversity in a Tropical Forest

Yves Basset,^{1,2,3*} Lukas Cizek,^{2,4} Philippe Cuénoud,⁵ Raphael K. Didham,⁶ François Guilhaumon,⁷ Olivier Missa,⁸ Vojtěch Novotný,^{2,4} Frode Ødegård,⁹ Tomáš Roslin,¹⁰ Jürgen Schmidl,¹¹ Alexey K. Tishechkin,¹² Neville N. Winchester,¹³ David W. Roubik,¹⁴ Henri-Pierre Aberlenc,¹⁴ Johannes Bait,¹⁵ Héctor Barrios,³ Jon R. Bridle,¹⁵ Gabriela Castaño-Meneses,¹⁶ Bruno Corbara,¹⁷ Gianfranco Curletti,¹⁸ Wesley Duarte da Rocha,¹⁹ Domir De Bakker,²⁰ Jacques H. C. Delabie,¹⁹ Alain Dejean,²¹ Laura L. Fagan,⁶ Andreas Floren,²² Roger L. Kitching,²³ Enrique Mediavero,³ Scott E. Miller,²⁴ Evandro Gama de Oliveira,²⁵ Jérôme Orivel,²⁶ Marc Pollet,²⁷ Mathieu Rapp,²⁸ Sérvio P. Ribeiro,²⁹ Yves Roisin,³⁰ Jesper B. Schmidt,³¹ Line Sørensen,³¹ Maurice Leponce²⁰

129,494 arthropods representing 6144 focal species (Fig. 1 and table S1) from 0.48 ha of intensively sampled mature forest. This allowed us to extrapolate focal arthropod species richness to a larger forest area with unprecedented power, through a series of best-informed species richness estimates derived from six competing models for each of 18 focal data sets. Using taxon ratios to estimate the species richness of nonfocal taxa [see "Extrapolating results to nonfocal taxa" in materials and methods (20)], we then predicted the total species richness of the study area. We



Models of standardised sampling



**Butterfly
Conservation**

Saving butterflies, moths and our environment

The screenshot shows a web-based data entry form titled "Walk Data Entry". It includes fields for "Select Transect" (dropdown menu), "Date" (07/04/2013), "Recorder Name" (Middleton, Ian), "Start Time (M:MM)" (dropdown menu), "End Time (H:MM)" (dropdown menu), "N/A" (checkbox), "Temp (Deg C)" (dropdown menu), "Wind Direction" (dropdown menu), and "Wind Speed" (dropdown menu). At the bottom are "Next" and "Cancel" buttons.

eBird

Step 2: Date and Effort

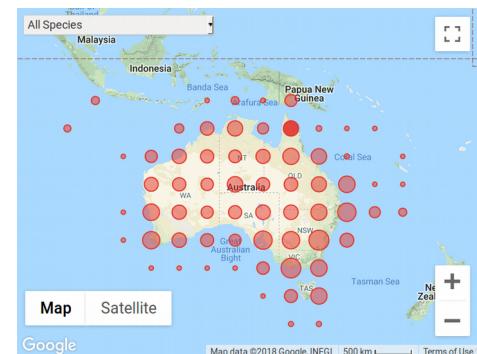
* = required field
Donaldson Park

* Observation type: Traveling Count Observations made while birding over a specified distance (preferably <5 mi) and duration. Examples include most general field birding, walking a trail or driving a refuge loop.
 Stationary Count Observations made from a specific location (moving <30 meters) and duration. Examples include hawkwatching, seawatching or watching birds from your window.
 Area Count Observations made from a specified area and duration, often when covering the same ground repeatedly. Examples include a thorough survey of your yard or local park.
 eBird Random Count Observations made from a randomly selected location for the eBird County Birding project.
 Casual Observation Incidental observations made when birding was not your primary purpose. Examples include a fly-over Osprey seen while driving to work or noting a few birds while gardening.

* Observation date: NOV 2009 Distance covered: miles
* Start time: hrs. 05 min. Elevation: feet
* Duration: hrs. 05 min.

Number of people in your birding party:

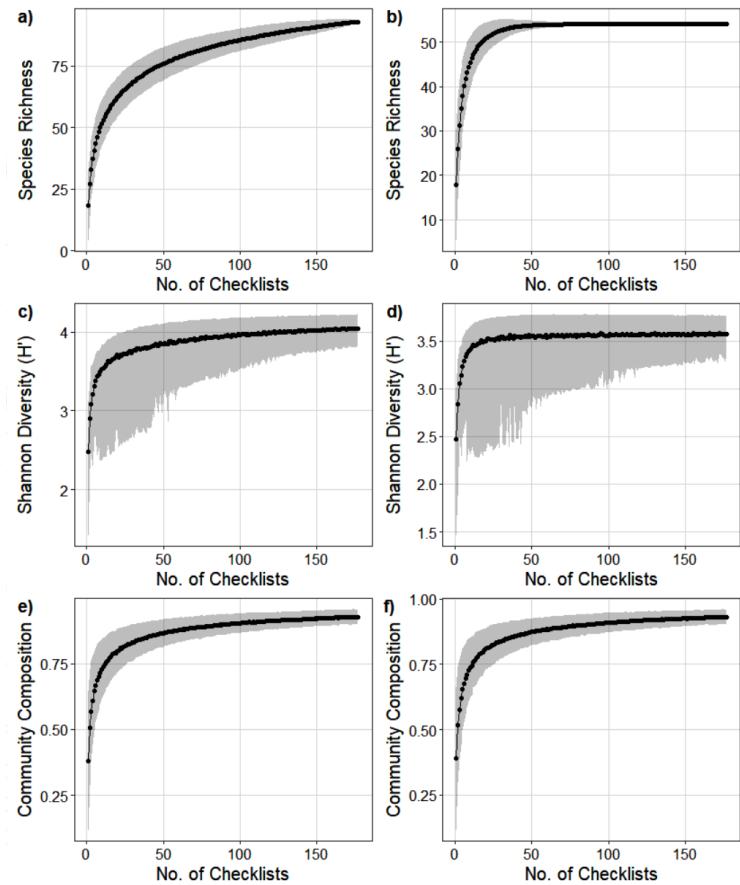
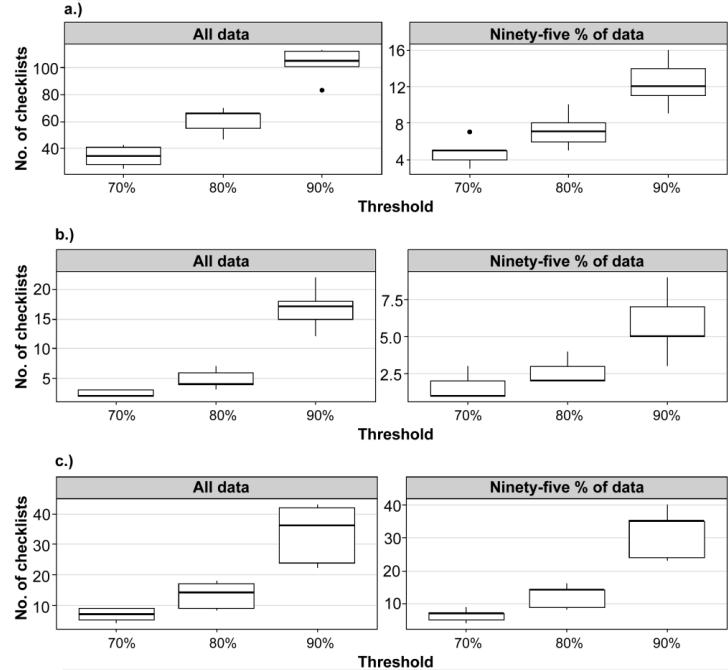
Continue



Standardised (and optimised) sampling



eBird

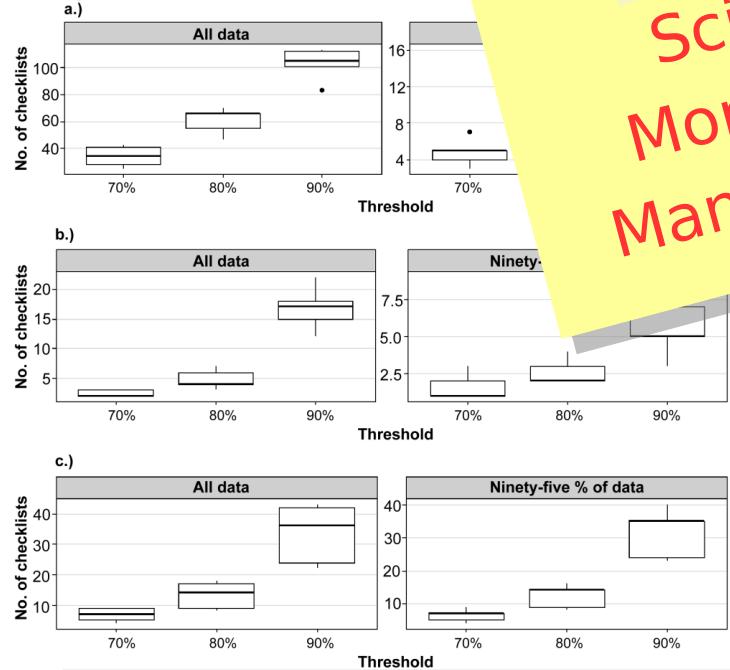


Callaghan et al 2017

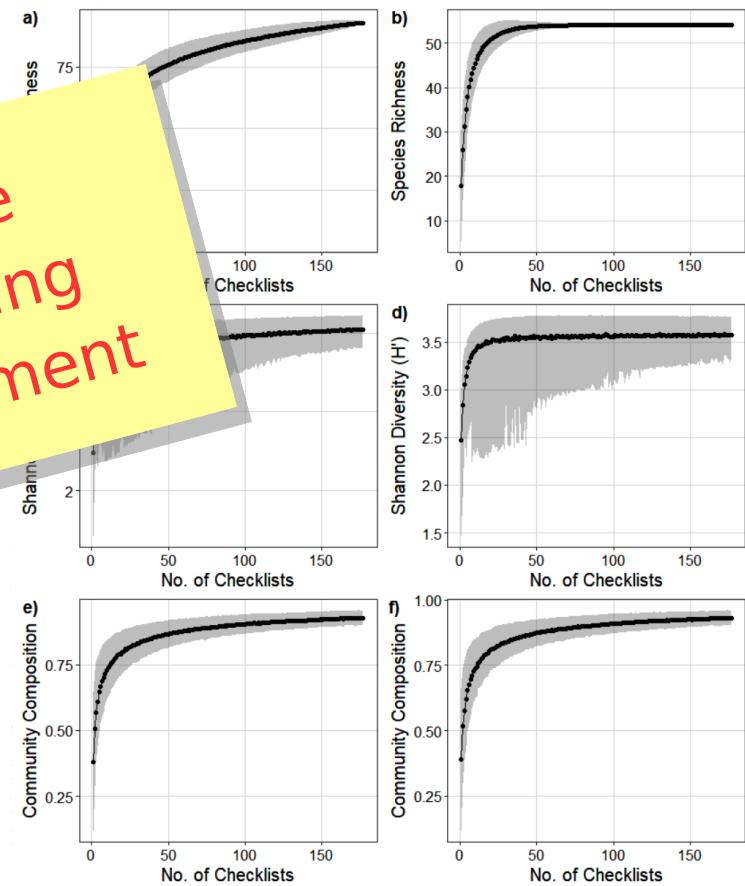
Standardised (and optimised) sampling



eBird



Science
Monitoring
Management



Callaghan et al 2017

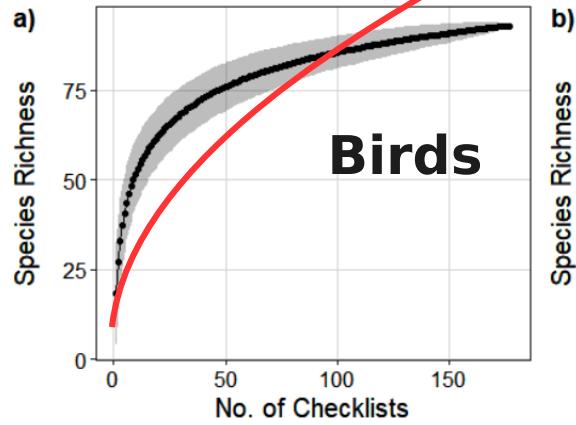
Sampling protocols for BioBlitz?

We are catching a lot!!

Yes, but how much...?



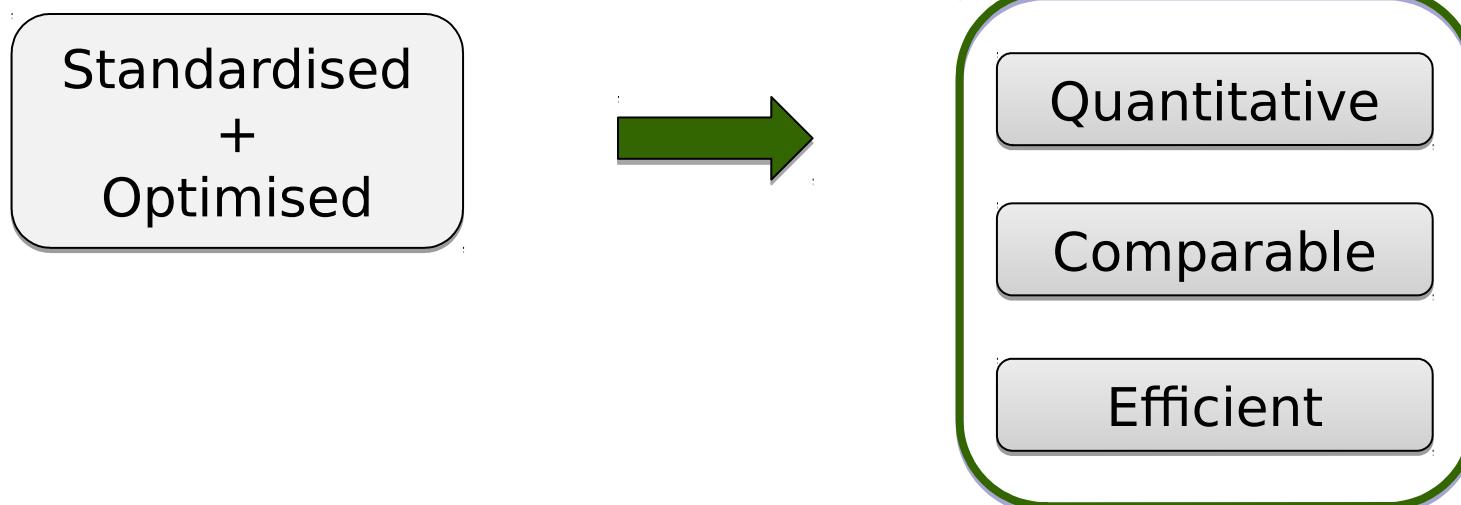
Invertebrates



A model for sampling protocols: COBRA



Conservation Oriented Biodiversity Rapid Assessment



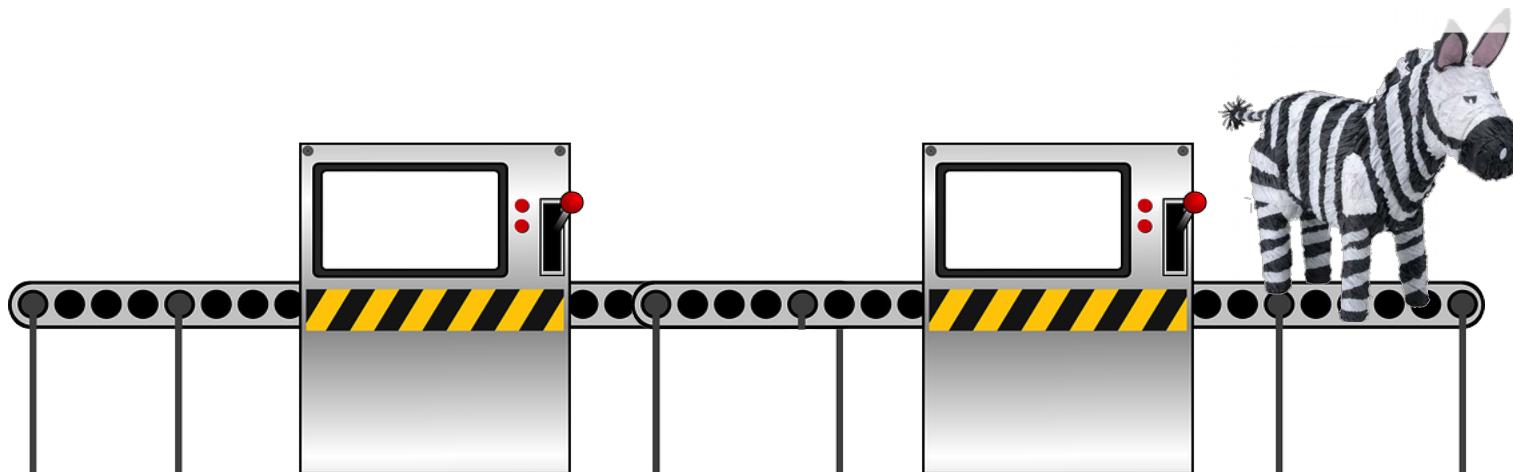
CEBRA sampling protocols

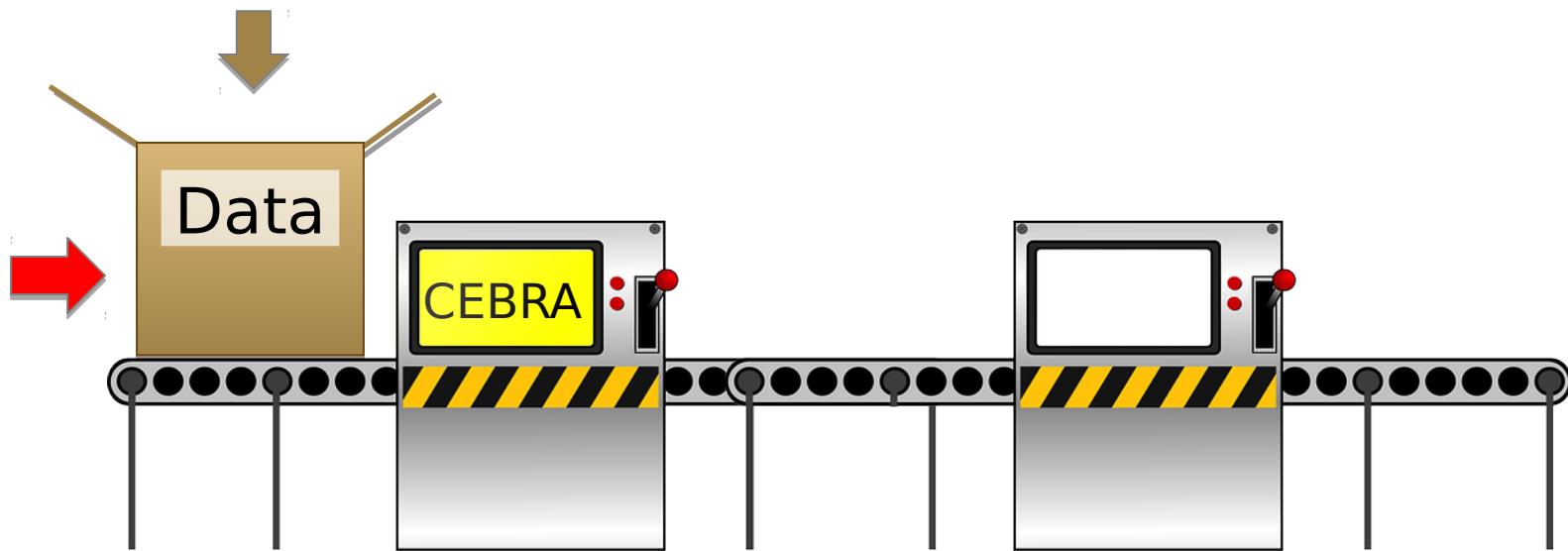
- Citizen-led Educational Biodiversity Rapid Assessment
- Optimised and standardised sampling protocol
- For citizen science activities (**BioBlitz**)



Making a CEBRA

- Citizen-led Educational Biodiversity Rapid Assessment
- Optimised and standardised sampling protocol

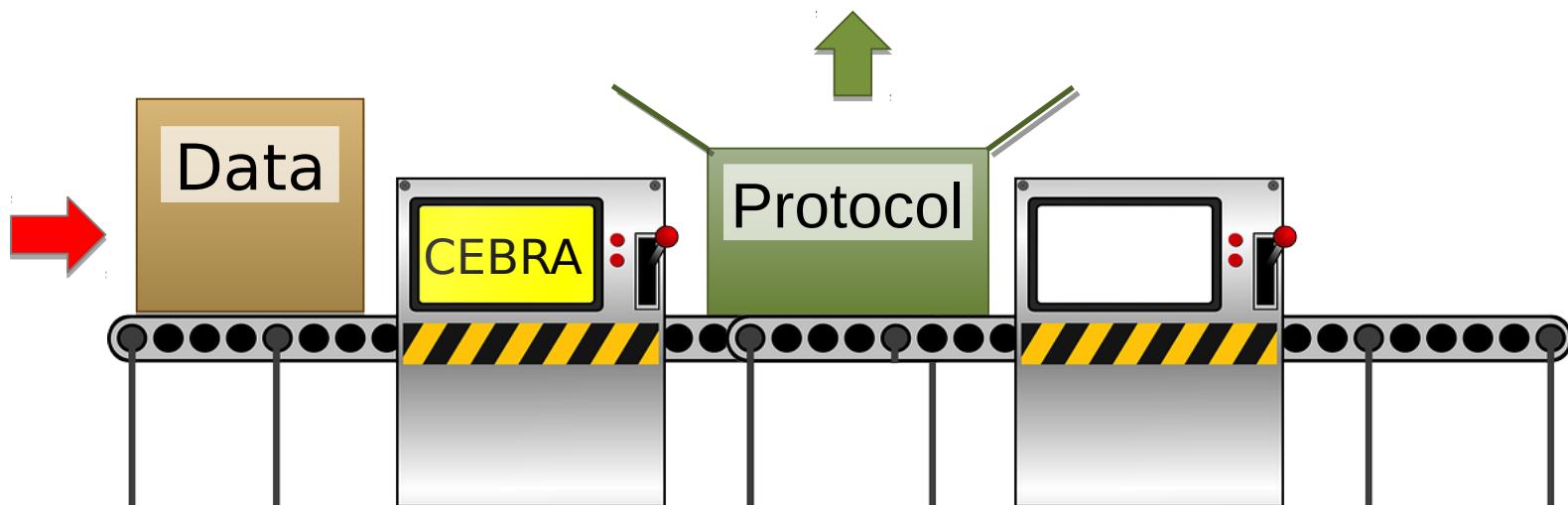


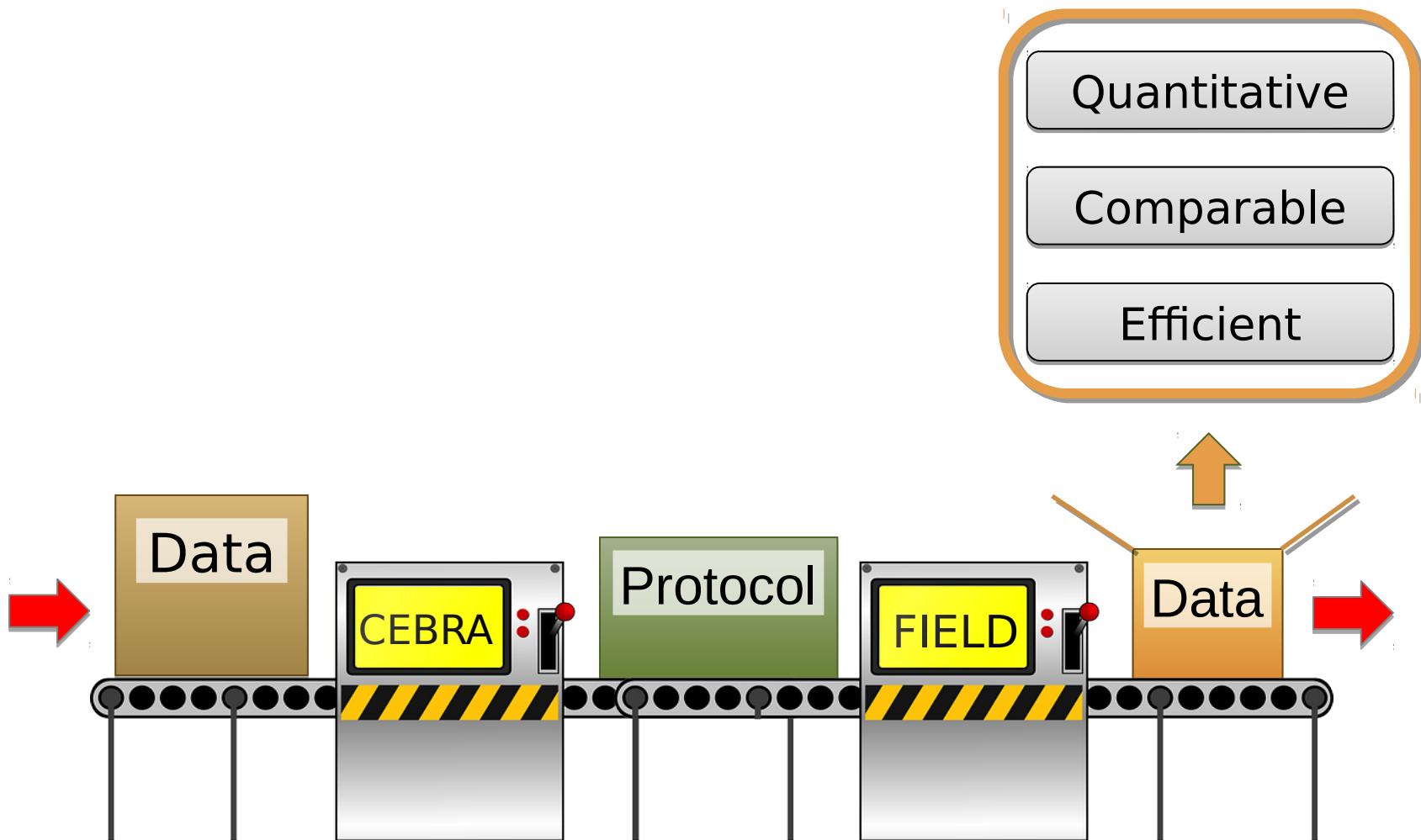


Optimised combination of samples

e.g.:

- 5 sweeping samples
- 4 foliage beating samples
- 6 pitfall traps

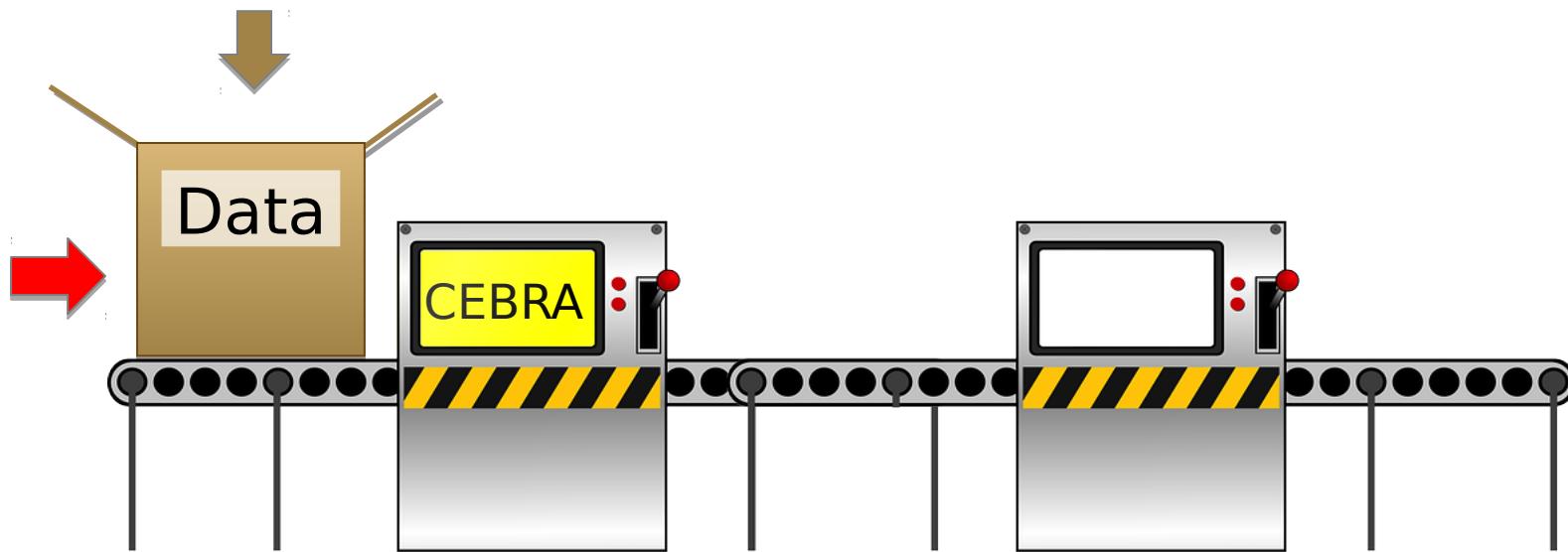




Malumbres-Olarte et al. 2016



- Barcelona (2016-2018)
- Nottinghamshire (2017-2018)
- **2019:** Sitges, Montserrat, Donostia, ...

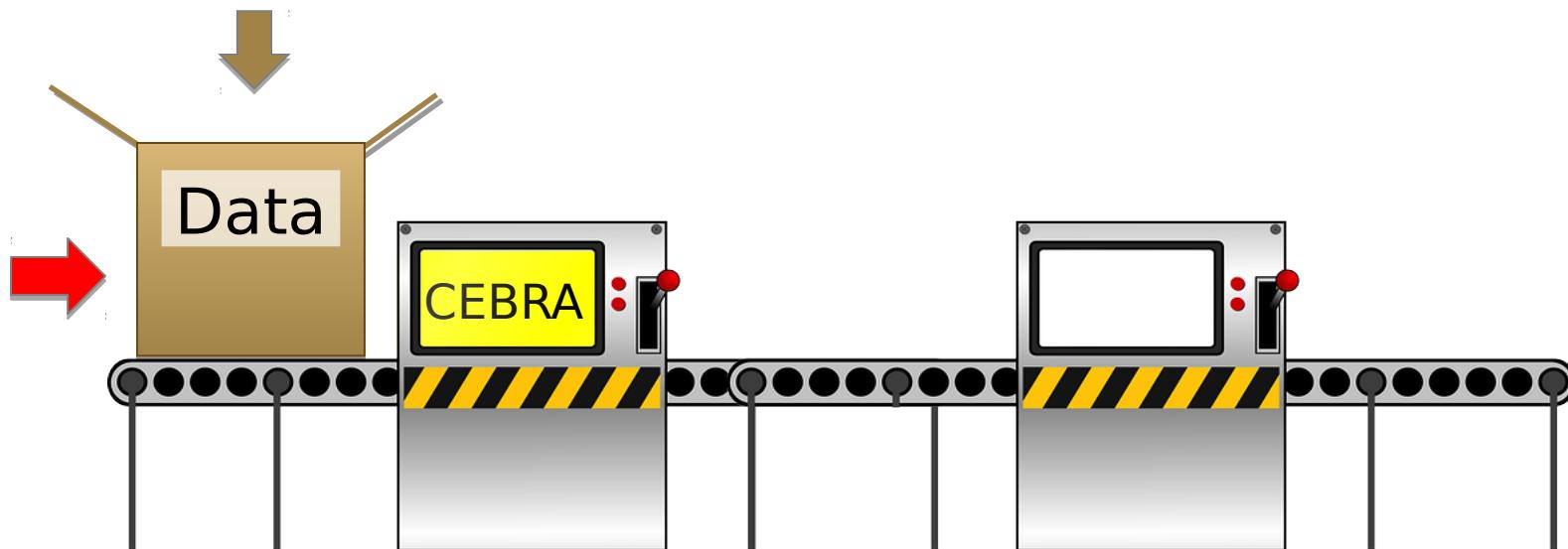




Samples: separate and comparable

Collectors/ sample: 2-3

Time/ sample: 10 min.





Spiders



- Variety of **climatic** and **habitat** requirements/ adaptations
- **Evolutionarily diverse**
- Key role in trophic webs/ **interactions** (predator/ prey)

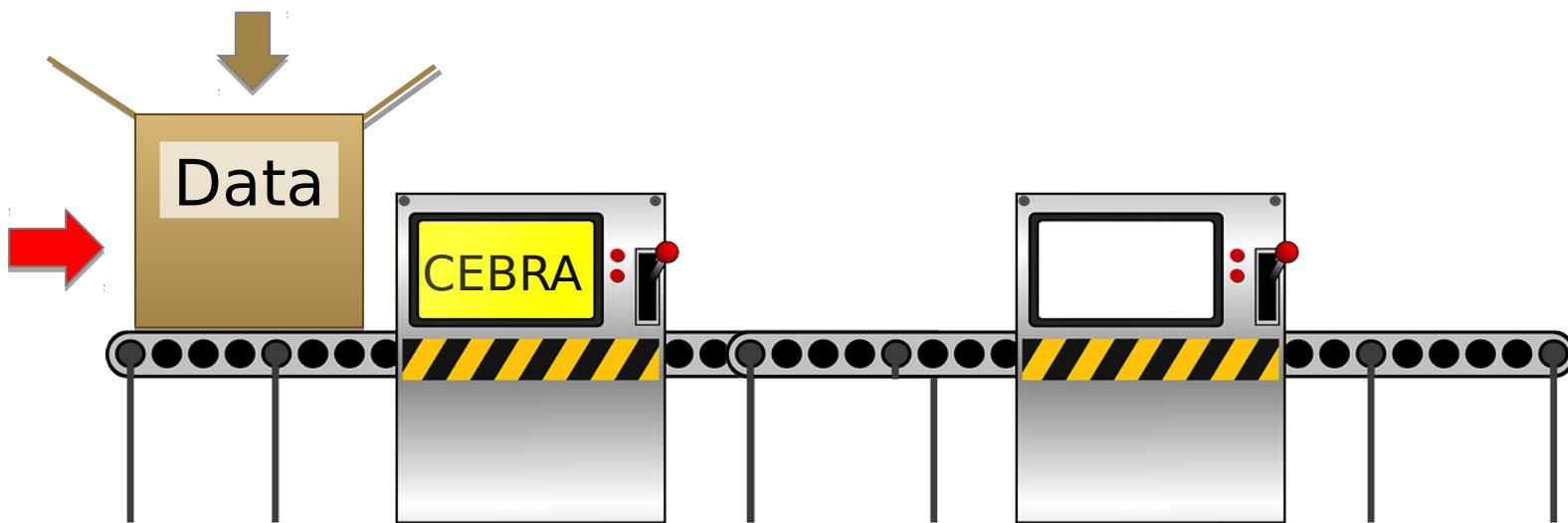
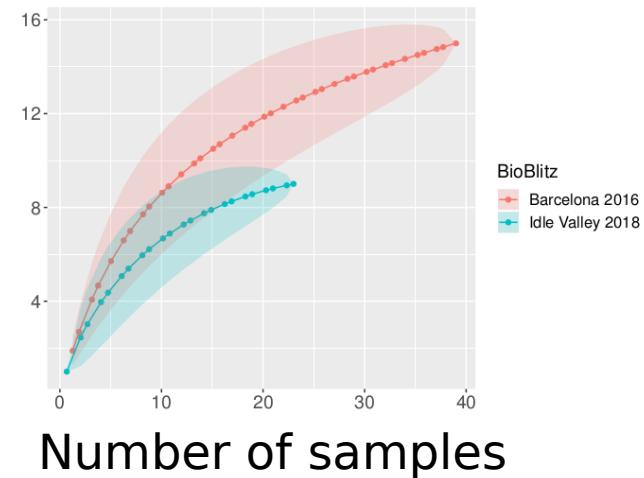
(Respond to (**indicators** of) changes in other organisms)

- Different **dispersal** abilities
- Abundant (**quantitative data**)
- Easy to **collect** (protocols)





Number of species



Outcomes

- More **quantitative, comparable** and “**measured**” data
- Increased **participation** of **experts**
- Facilitate **evaluation of data**
(sampling effort, ‘ignorance scores’, etc.)
- A tool for **Scientific literacy**
(learning about importance of standardisation in science)
- **Easy** to apply and design (if you have the data)

For better
scientific answers,
monitoring and
management

Thanks

