



THE UNIVERSITY OF
**WESTERN
AUSTRALIA**

Model transferability: Lessons learnt & ways forward



Phil Bouchet

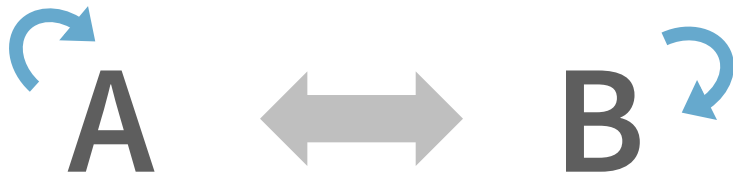
IMCC4 – St John's, Newfoundland
July 31, 2016

Ana Sequeira, Erin Peterson, Kerry
Mengersen, Julian Caley, Katherine Yates

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An operational **definition**

“Transferability (generality) is the ability of a model to make meaningful and **accurate predictions of independent events, i.e. under novel conditions** (regions and/or times not encountered during calibration)”

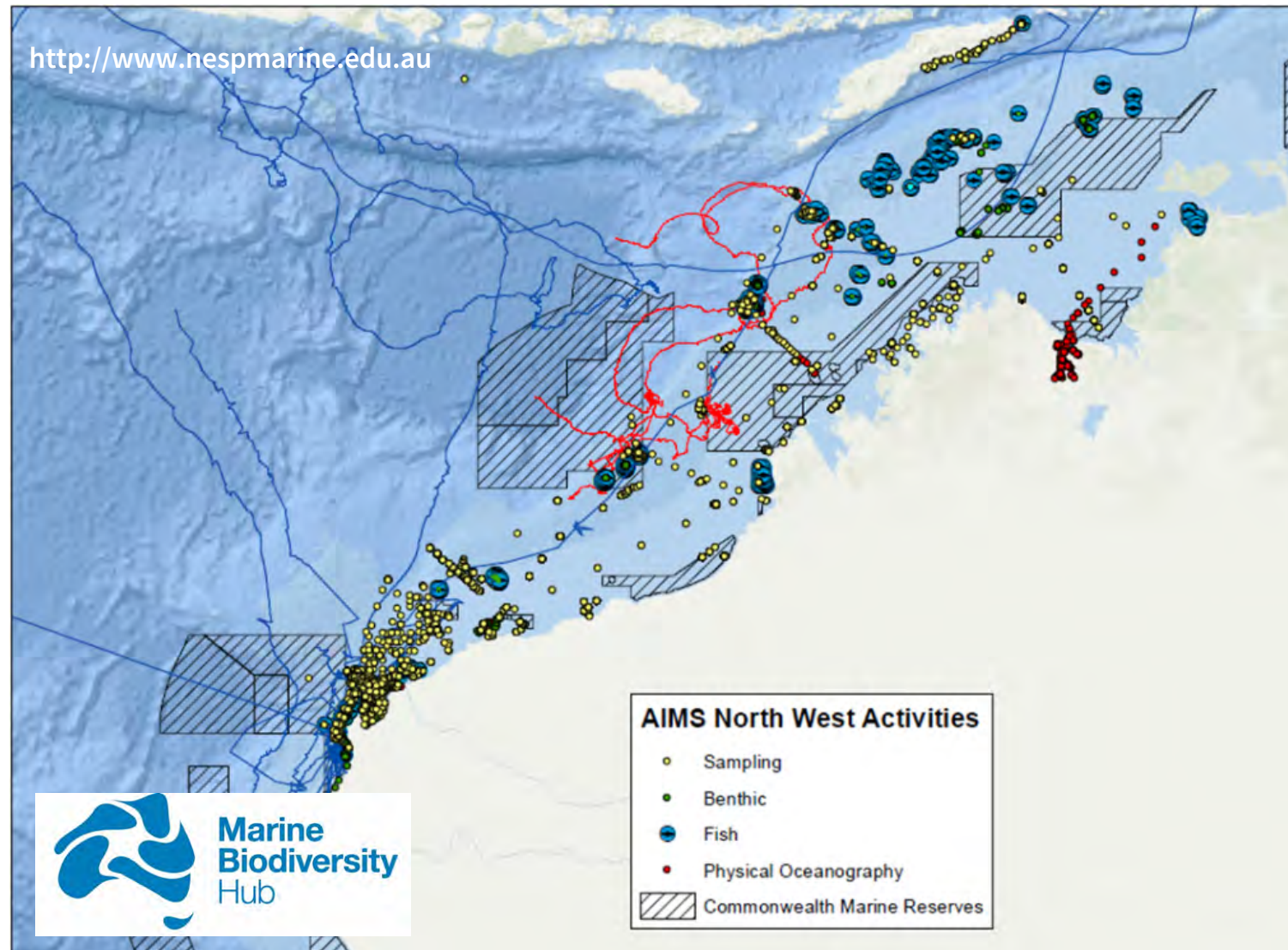


Godsoe et al. (2015). *Am Nat* 185, 281-290

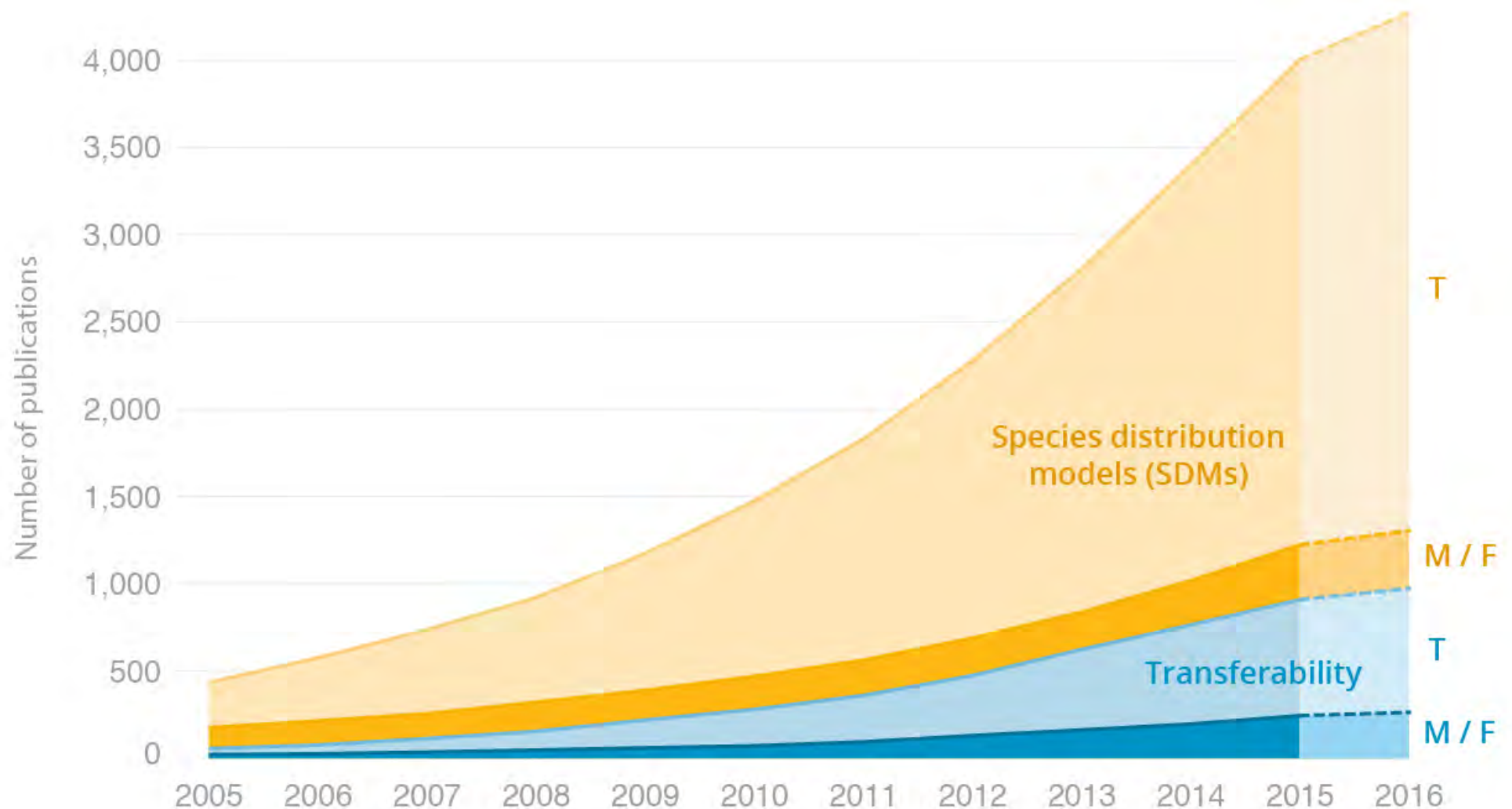
Deblauwe et al. (2016). *Glob Ecol Biogeogr* 25(4), 443-454

Dobrowski et al. (2011). *Ecol Monog* 81(2), 241-257

A tool for **conservation & management**

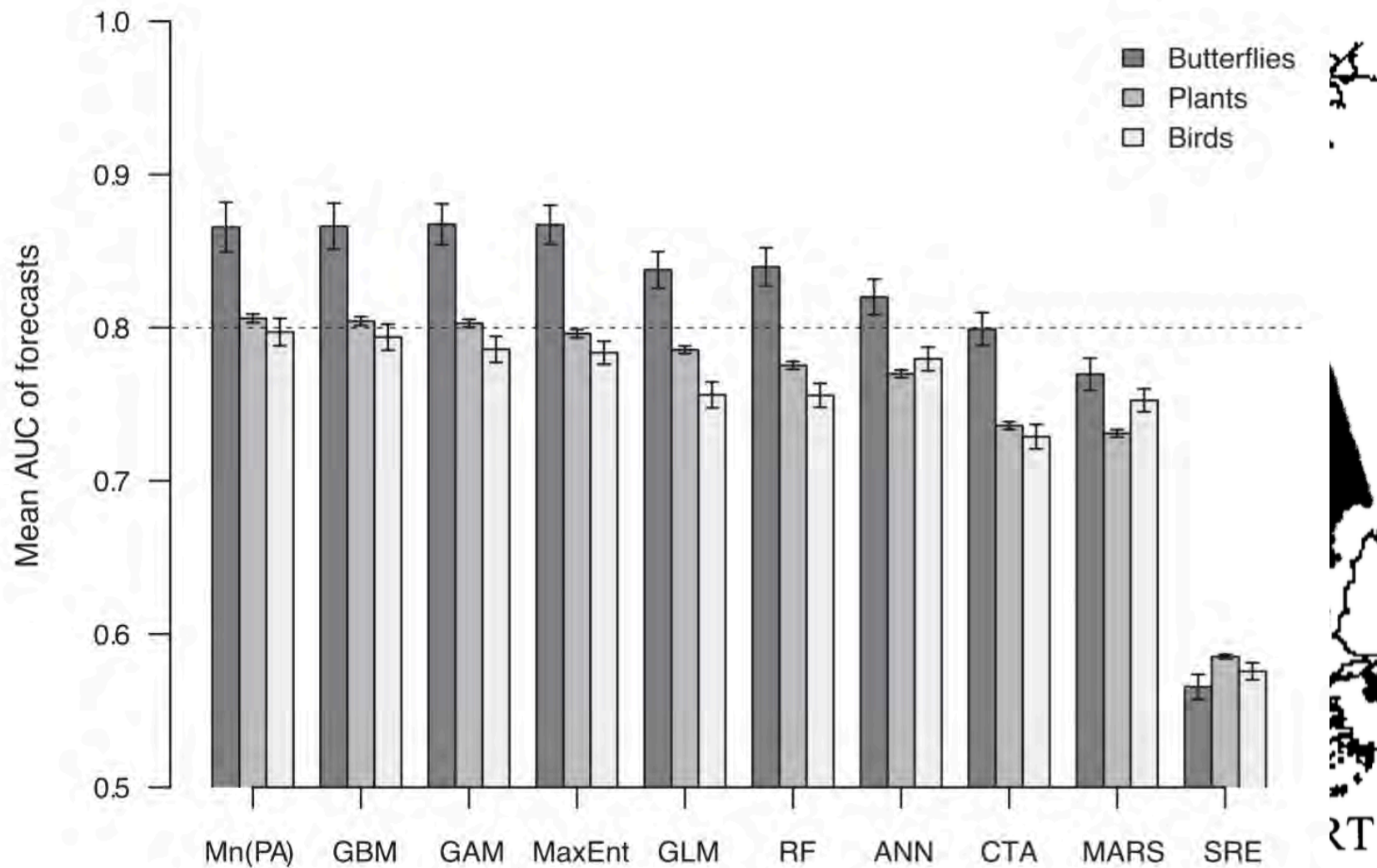


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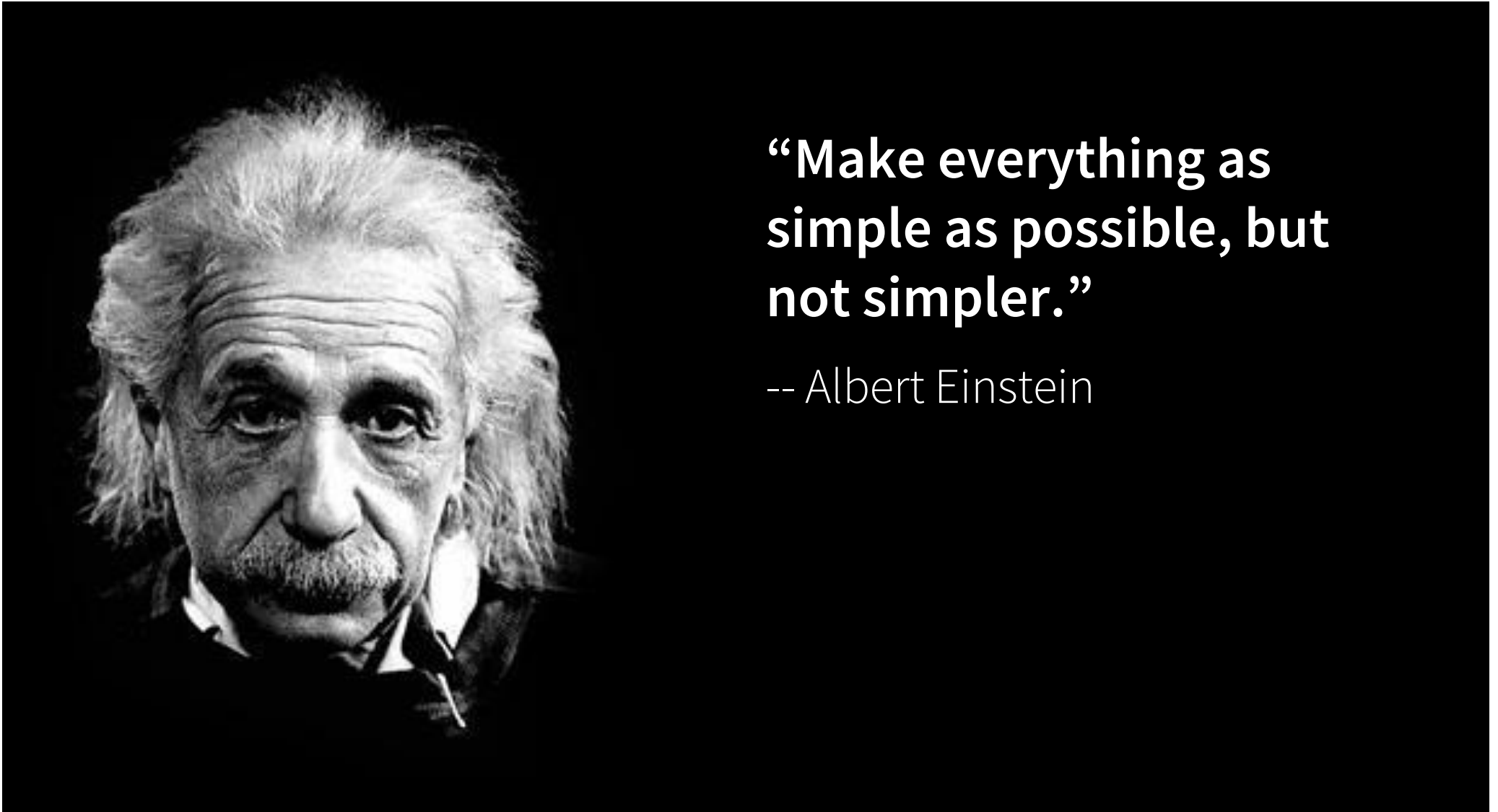
An emerging **branch of science**

Data from: ISI Web of Science

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Winners & losers **in the transfer games**

Rapporter (2003) / 2012 / 2013 / 2014 / 2015 / 2016 / 2017 / 2018 / 2019 / 2020 / 2021 / 2022



Data collection

- Large sample size ✓
- Geographic extent ✓
- Imperfect detectability ✗
- Uneven coverage ✗
- Field sampling design ?

Model calibration

- Multi-region training ✓
- Validation on independent data ✓
- Over-fitting ✗
- Direction of transfer ?

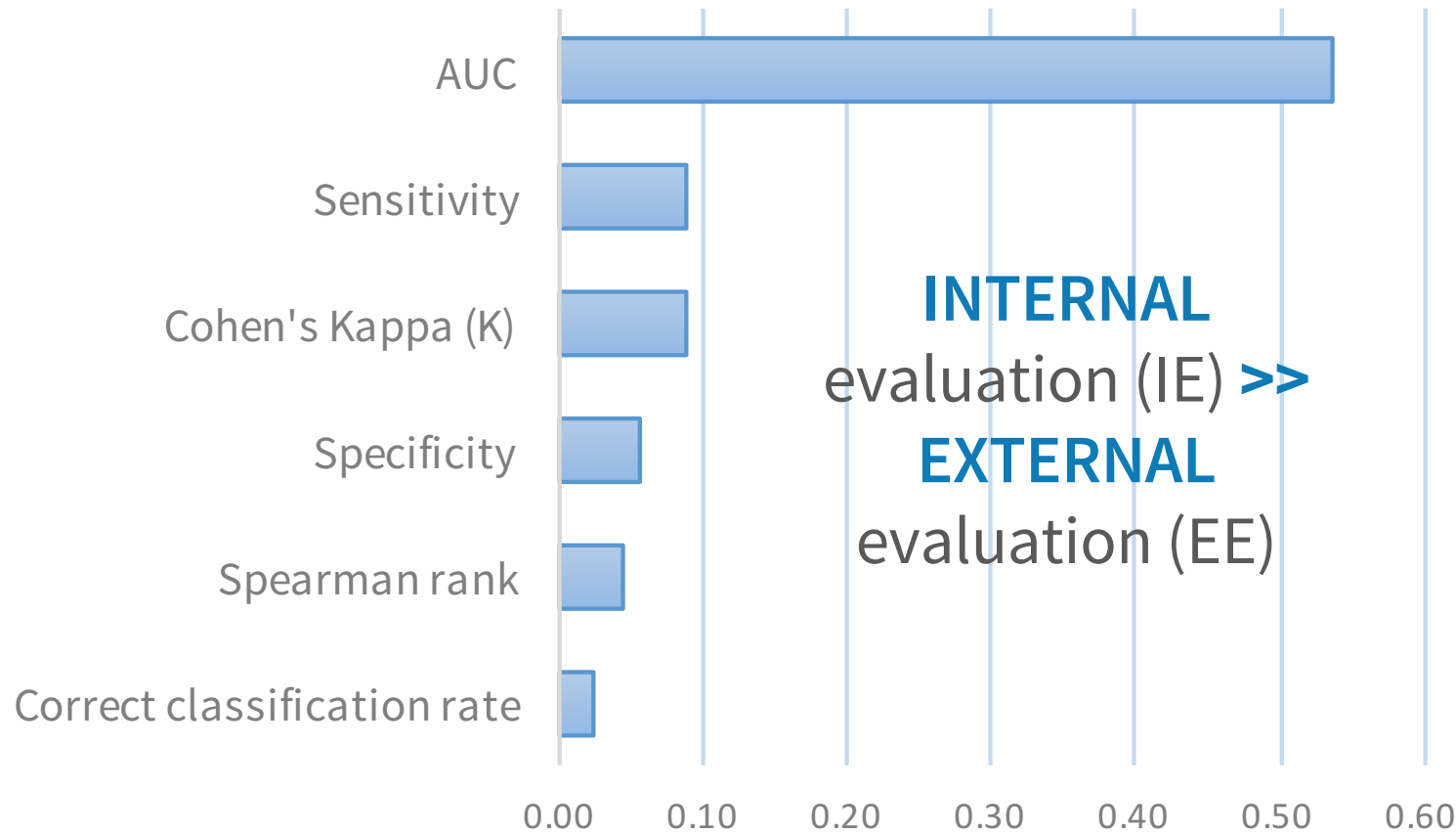
Explanatory variables

- Direct predictors ✓
- Biotic interactions ✓
- Contingent absences ✓
- Climate scenario ✗
- Collinearity ✗

Study species

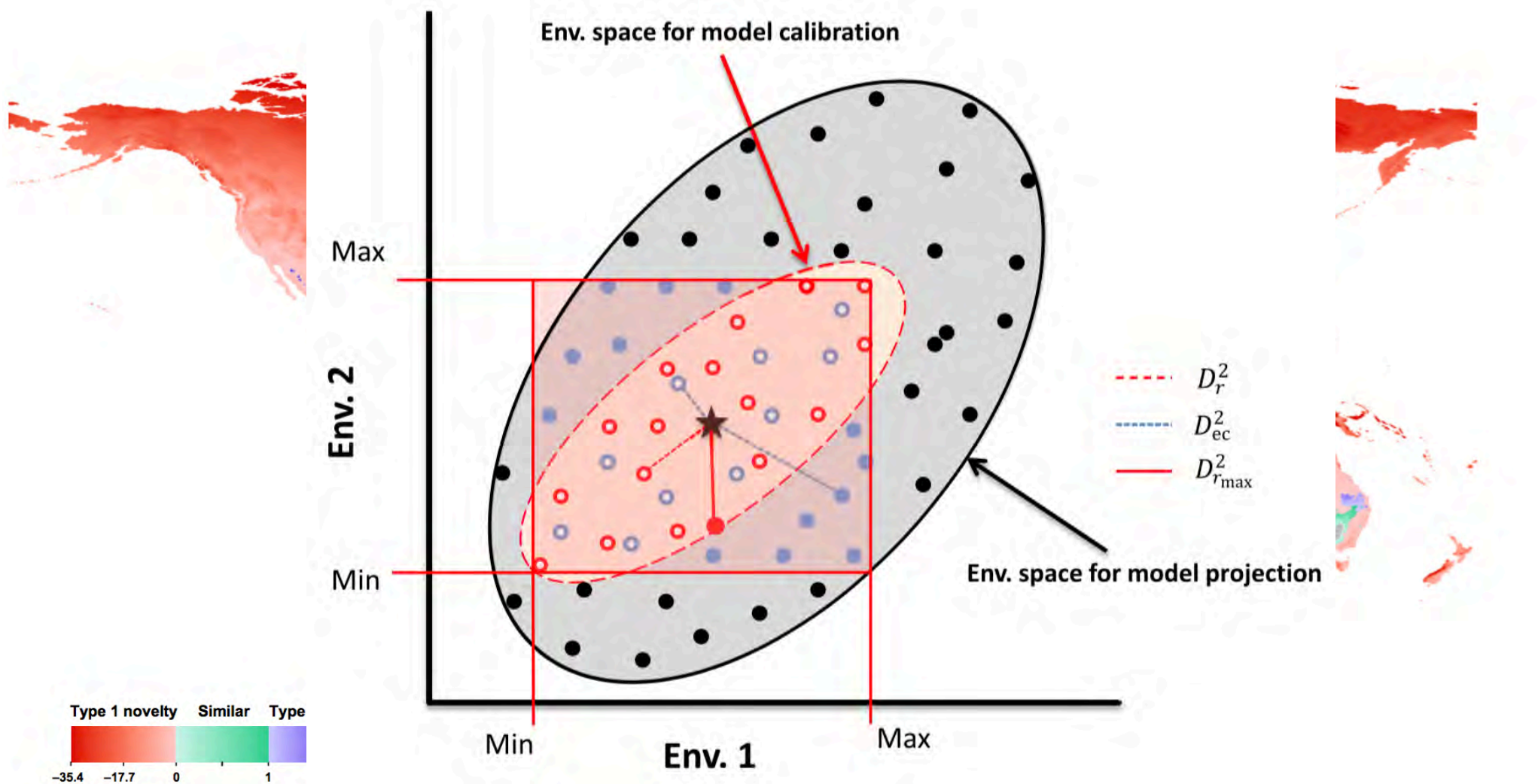
- Assemblage composition ✓
- Behavioural plasticity ✓
- Movement constraints ✓
- Prevalence ?

Putting a **number** on transferability



$$TRI = \frac{\frac{1}{2} \left(\left(1 - \frac{|AUC_{A \rightarrow A} - AUC_{A \rightarrow B}|}{0.5} \right) + \left(1 - \frac{|AUC_{B \rightarrow B} - AUC_{B \rightarrow A}|}{0.5} \right) \right)}{1 + \left| \frac{|AUC_{A \rightarrow A} - AUC_{A \rightarrow B}|}{0.5} - \frac{|AUC_{B \rightarrow B} - AUC_{B \rightarrow A}|}{0.5} \right|}$$

Here be dragons: **Exploring extrapolation**



ExDet tool -- Mesgaran *et al.* (2014). Div Distr 20(10), 1147-1159

Multivariate environmental similarity surface (MESS)

Elith *et al.* (2010). *Methods in Ecology & Evolution* 1(4), 330-342

Inflated response curves & environmental overlap gap

Zurell *et al.* (2012). *Diversity & Distributions* 18(6), 628-634

Mobility-oriented parity (MOP)

Owens *et al.* (2012). *Ecological Modelling* 263, 10-18

Prediction uncertainty assessments using residual variation (PURV)

Engler & Rödder (2012). *Biodiversity Informatics* 8, 30-40

FOCUS group FG43**Salon G. 11am – 1 pm**

Acknowledgements



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