

PERSPECTIVE



Department of Biology, University of Vermont, Burlington, VT 05405, USA

ABSTRACT

Climate change is driving species range shifts, and genetic clusters and markers are being used to understand these shifts. MaxEnt and MaxLike are used for species distribution modelling.

Keywords

Climate change, genetic clusters, genetic markers, MaxEnt, MaxLike, species distribution modelling, species range shifts.

INTRODUCTION

Species range shifts are occurring globally due to climate change. Genetic clusters and markers are being used to understand these shifts. MaxEnt and MaxLike are used for species distribution modelling.

Climate change is driving species range shifts, and genetic clusters and markers are being used to understand these shifts. MaxEnt and MaxLike are used for species distribution modelling.

SPECIES DISTRIBUTION MODELS

f - (et al., 2002)

171). D^f f f (J ,

2003) f f f I (,

f (B et al., 2005),

(D & , 2007)

f , f f (

, 2013) f f

(N et al., 2012). D f

et al., 2002).

f \rightarrow A \rightarrow f
 f \rightarrow f (et al.,

f , ,
 , f
 - f
 (B & , 2007). D
 f ff f
 (H & , 2000),
 (et al., 2003),
 & , 1 2)
 A B &
 (2007) , f
 f A
 f f
 , f
 (et al., 2012), f
 f f (et al.,
 2013). ff
 f f
 , f
 f
 f
 f (&
 A , 2014).

MODELLING SPECIES RANGE LIMITS WITH GENETICALLY DISTINCT CLUSTERS

A f
 f /
 f
 f (& N , 1).
 f /
 f A
 f (AI) f f
 f
 et al. (200) f
 A f et al.
 (2007) f J f
 f
 ff -
 f f
 f m P_{kj}
 k j. f
 f
 f

American Journal of Human Genetics, 63, 61–6 .

B . . . D B B . . .
 D . . . H B H . . .
 . . . B J & . . . A . . .
 (2011) f f . . .

. Science, 334, 652–655.

B . . . D . . . A . . . et al.
 (2014) f . . .

. Nature, 507, 4 2.

D B . . . B . . . B . . . B
 B . . . A . . . D . . .
 H . . . H . . . B . . . J
 . . . D B D & . . . D (2006) . . .

3 (3). Journal
 of Climate, 19, 2122–2143.

. & . . . (2012) f . . .
 f . . . Genetics, 192,
 205–240.

Hallgrímsson, A., & ... (2010) f
Molecular Ecology, 19, 45–471.

Hallgrímsson, A., ... B, ... B, ... H, ... (2011) A
Arabidopsis thaliana. Science, 334, 3–6.

Hallgrímsson, A., ... B, ... D, ... H, ... H, ... (2013) A
PLoS ONE, 8, 164.

Hallgrímsson, I. & ... (2000)
Nature, 404, 755–75.

Hallgrímsson, A., ... & ... (2014) A
The American Naturalist, 183, 157–173.

Hallgrímsson, I. & ... (2013) I f f
Ecography, 36, 64–67.

Hallgrímsson, I. (200) A
The American Naturalist, 173, 57–5.

Hallgrímsson, A., ... H., ... & A, ... D
(2006) ff f
Ecography, 29, 773–75.

Jónsson, ... (171) f
The Wilson Bulletin, 83, 215–236.

Jónsson, ... A, ... H, ... D, ... (2012) f
Molecular Ecology, 21, 2354–236.

Jónsson, ... B, A, ... B, ... D, ... (2007) A
(A) f
Molecular Ecology, 16, 355–36.

Jónsson, ... & ... D (2010)
Journal of Evolutionary Biology, 23, 1720–1731.

Jónsson, ... & ... (200) A f
PLoS ONE, 3, 4010.

Jónsson, ... (16) f
Annual Review of Ecology and Systematics, 27, 237–277.

Jónsson, ... B, ... H, A, ... (200) f
Nature, 462, 1052–

... A ... & ... (2006) -
f
Ecological Modelling, **190**, 231–25 .

... J ... & D ... (2000) I f
Genetics, **155**, 45– 5 .

... B ... J. (200) -
f Science, **321**, 6.

(2013) R: a language and environment for sta-
tistical computing. f

... A ...
... A. & A ... (2014)
Maxent f
Journal of Biogeography, **41**, 62 –
643.

... B & ... (2007) f
Molecular Ecology, **16**, 3 73–3 2.

... A. & D ... (200) Hierarchical modeling
and inference in ecology: the analysis of data from popula-
tions, metapopulations and communities. f

10.1111/j.1365-3113.2011.04631.x / 2250-1501(201107)45:512:52.0107053.X(4631:4504:3(2