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Sounding out ecoacoustic metrics: avian species richness is predicted by acoustic indices in temperate but not tropical habitats

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ELDRIDGE ET AL – ACOUSTIC INDICES PREDICT AVIAN SPECIES

SUPPLEMENTARY MATERIALS A

SA. Environmental Details for Study Sites

SA.1 UK Sites

The UK forest site (UK1), Plashett Park Wood, is a 154 ha ancient woodland (SSSI), known to be at least 200 years old and dating back to the Middle Ages. It is a lowland mixed deciduous woodland; the bulk is semi-natural (NVC W8, W10, W16) dominated by pedunculate oak-hornbeam with birch and hazel, and hazel-sessile oak, although some parts are modified by conifer planting. The secondary site (UK2), Knepp Estate, is a 1400 ha private estate which has been undergoing restoration since 2001 having previously been an arable and dairy farm. A phase 1 habitat survey carried out in 2005 reported that nearly 60% of the project area is grassland, some 21% is woodland (predominantly NVC W10) including wood pasture/parkland and 1.1% is scrub. The agricultural site (UK3), Balmer Farm, is a 500 ha farm situated on the SE slopes of the south downs. Survey points were situated in a 56 ha single crop barley field surrounded by other arable fields to the N, E and S and by a field sparsely populated by sheep to the E. At the time of survey, the crop was approximately 50 cm high and recorders attached to posts with microphones clearing the tops of the barley. Altitude range across the three sites was 10 m - 50 m.

SA.2 Ecuadorian Sites

The primary forest site (EC1) is located within the Tesoro Escondido forest cooperative Tesoro, an evergreen lowland neotropical forest (Sierra 1999) of approximately 3000 ha which lies in the buffer zone of the Cotacachi Cayapas Ecological Reserve. The secondary forest (EC2), is a forest reserve of 10 ha, isolated around 40 years ago from the primary forest and surrounded by farms of mixed fruit trees, pastures and palmito trees (*Chamaerops humilis*). The agricultural site (EC3) of around 40 ha, is dominated by palm oil trees (*Elaeis guineensis*), with a few hectares of palmito (*Chamaerops humilis*) and mixed fruit trees. It is surrounded by other oil palm plantations and pastures and situated on the outskirts of Puerto Quito. All sites were located between 130-390 m altitude.

SUPPLEMENTARY MATERIALS B

SB Instructions Given to Ornithologists

Avian chorus density - A measure of acoustic activity: Percentage of time bird vocalisations occur in total min (background and foreground) 0-25% , 25-50%, 50-75 %, 75%-100 %

Anuran chorus density - A measure of acoustic activity: Percentage of time frog vocalisations occur in total min (background and foreground) 0-25% , 25-50%, 50-75 %, 75%-100 %

Invertebrate chorus density - A measure of acoustic activity: Percentage of time insect vocalisations occur in total min (background and foreground) 0-25% , 25-50%, 50-75 %, 75%-100 %

Rain

0. still - no background noise
1. low rain - some noise
2. moderate rain noticeable-interferes with audio
3. loud rain- approaches level of biophony (frogs, birds,etc)
4. very loud rain- biophony inaudible

Wind

0. no background noise
1. low noise
2. moderate noise noticeable-interferes with audio
3. loud noise, approaches level of biophony (frogs, birds,etc)
4. very loud wind - biophony inaudible

Plane/car/motor noise

0. none
1. light - background
2. moderate noticeable - interferes with audio
3. loud noise - approaches level of biophony (frogs, birds,etc)
4. recording ruined --biophony inaudible

Human voice/music

0. none
1. light - background
2. moderate noise
3. loud noise - approaches level of biophony (frogs, birds,etc)
4. recording ruined --biophony inaudible

Other noise

0. none
1. light - background
2. noticeable - interferes with audio
3. loud noise - approaches level of biophony (frogs, birds,etc)
4. recording ruined -- biophony inaudible

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SUPPLEMENTARY MATERIALS C

SC Normality Tests for Species Richness

	UK1	UK2	UK3	EC1	EC2	EC3
NN_μ	6.14	8.18	3.11	4.01	4.99	4.76
NN_σ	2.48	2.66	2.14	2.30	2.46	2.78
N0_μ	5.00	6.41	2.81	3.39	4.50	4.37
N0_σ	2.48	2.66	2.14	1.89	2.17	2.50

Table SC1 Mean and standard deviation avian species abundance (NN) and richness (N0) per site for each habitat in UK (left) and Ecuador (right).

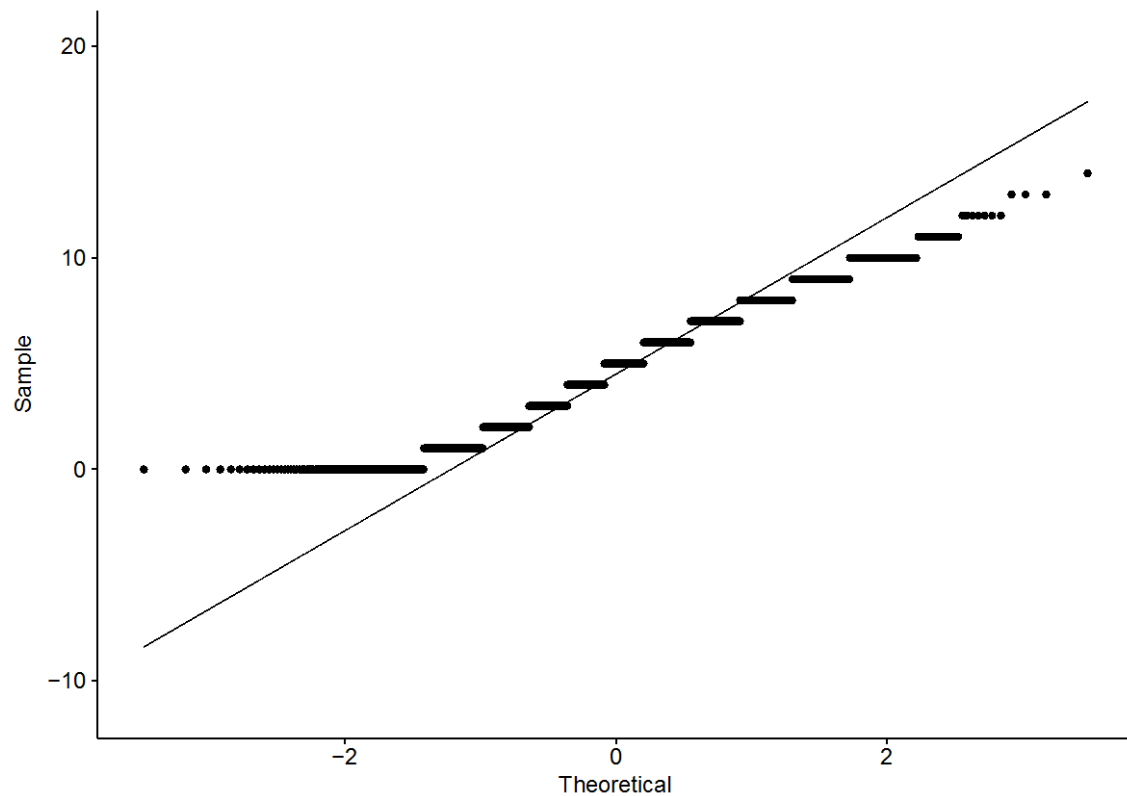


Fig. SC1 QQ plot for UK Avian Species Richness. Shapiro-wilk normality test showed data to violate assumptions of normality: $W = 0.967$, $p < 0.0001$ ($N = 1976$)

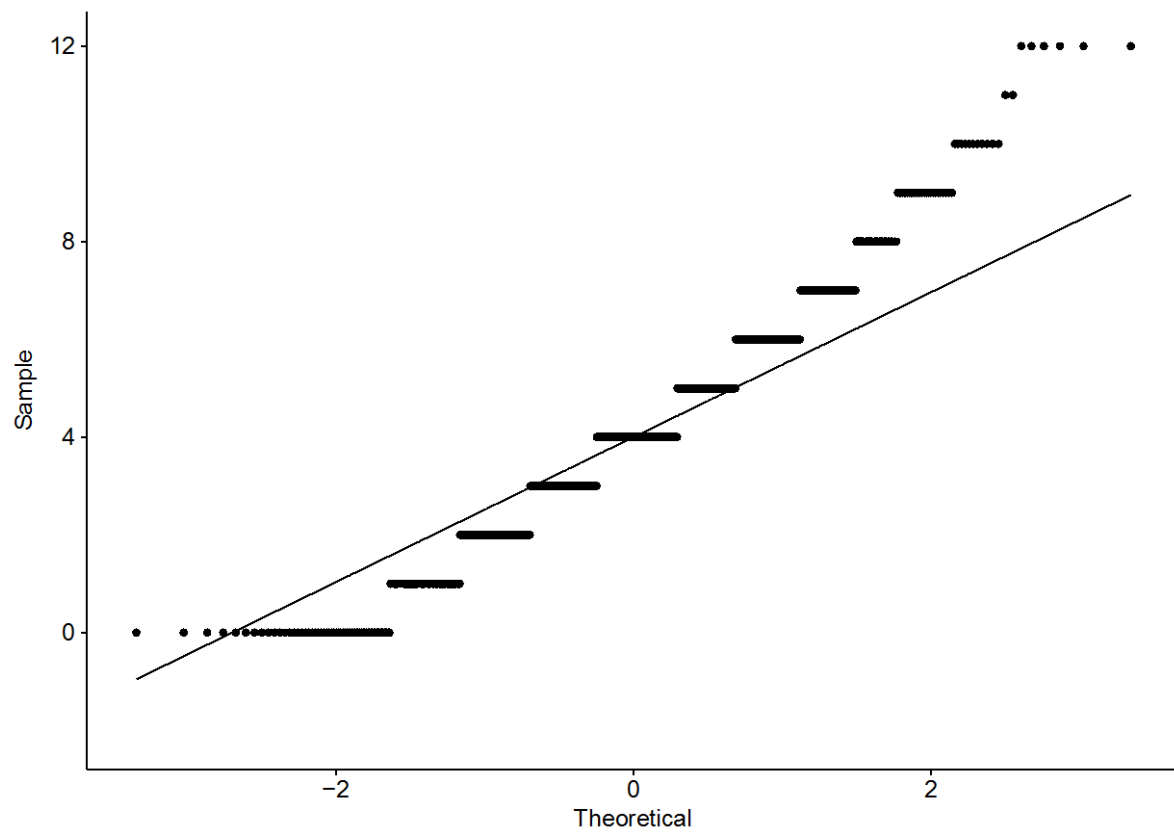


Fig. SC2 QQ plot for EC Avian Species Richness. Shapiro-wilk normality test showed data to violate assumptions of normality:
 $W = 0.968$, $p < 0.0001$ ($N = 1201$)

	UK1- UK2	UK2- UK3	UK3- UK4	EC1- EC2	EC2- EC3	EC3- EC4
W	142410	330310	363830	63172	59380	79164
p	0.000	0.000	0.000	0.000	0.000	0.1745

Table SC2 Mann-Whitney W and p-values for differences between avian species richness at each habitat type

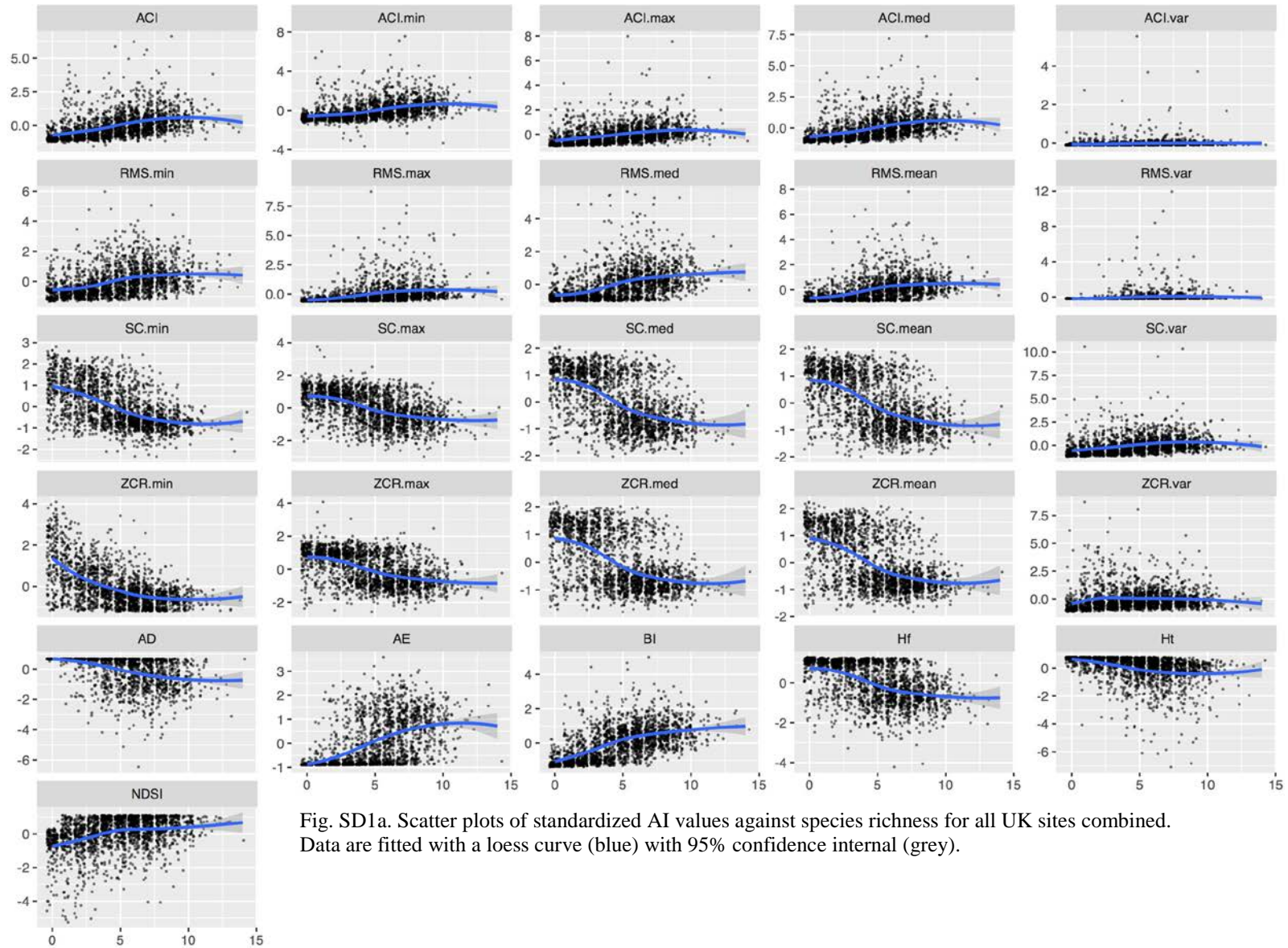
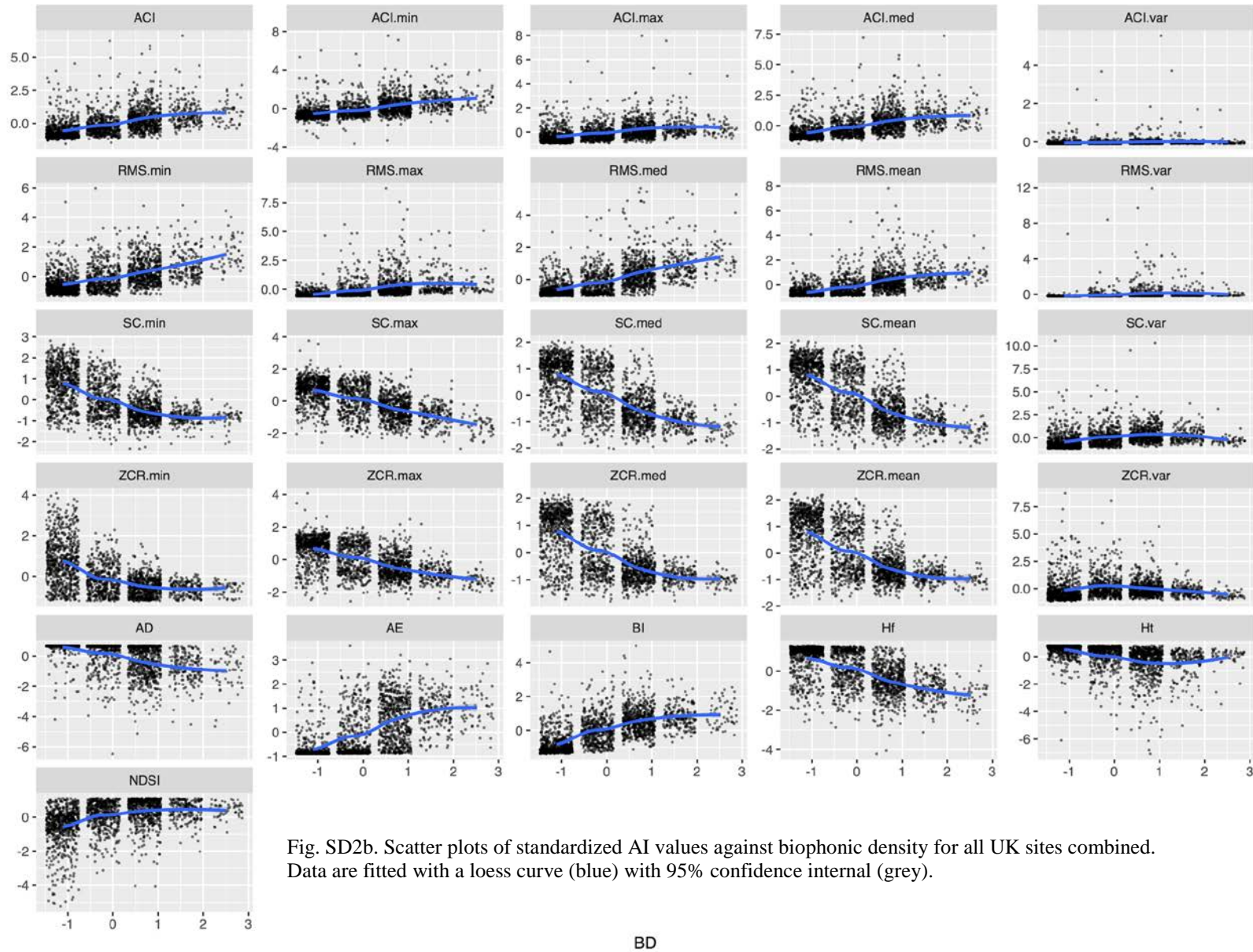


Fig. SD1a. Scatter plots of standardized AI values against species richness for all UK sites combined. Data are fitted with a loess curve (blue) with 95% confidence interval (grey).



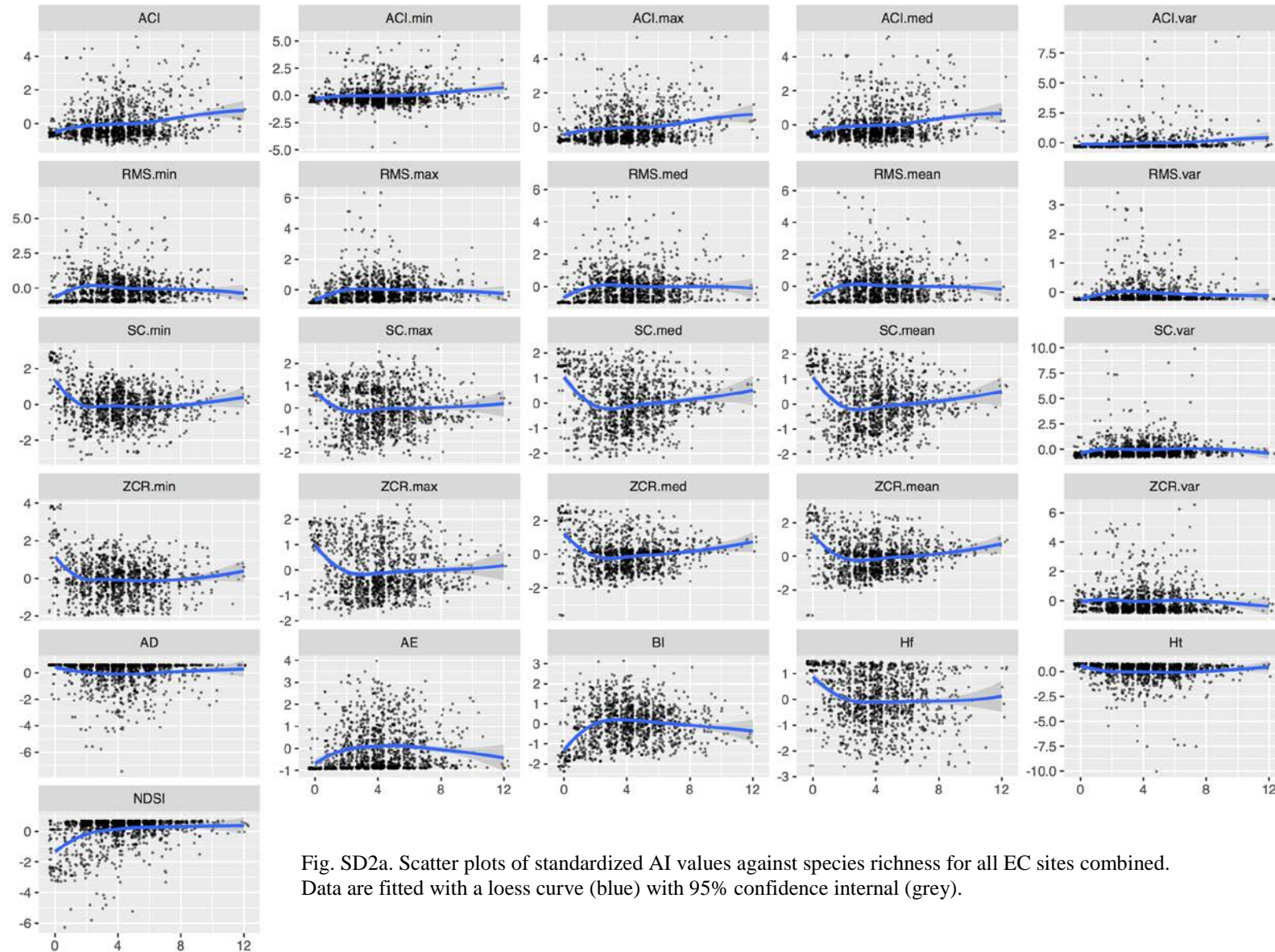
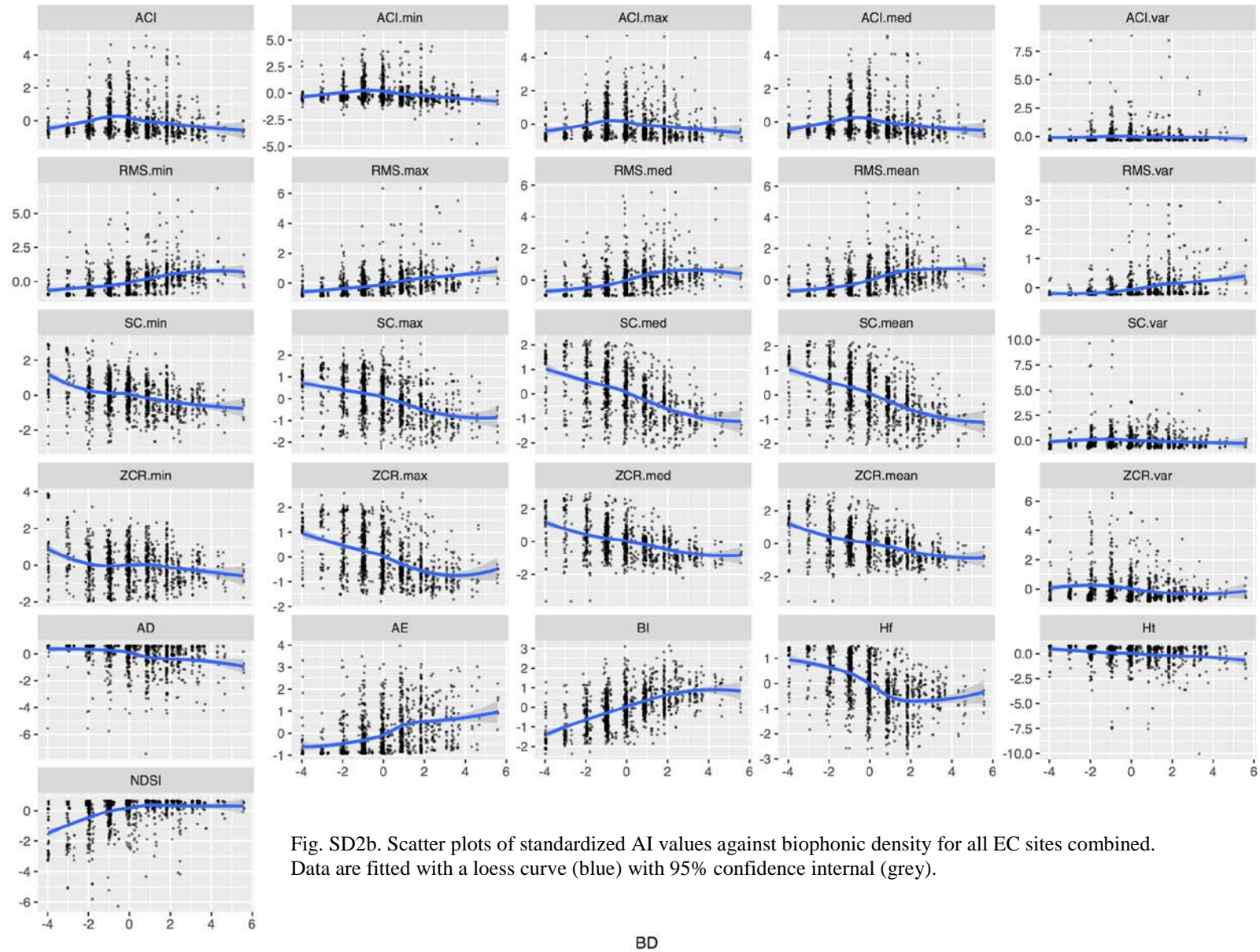
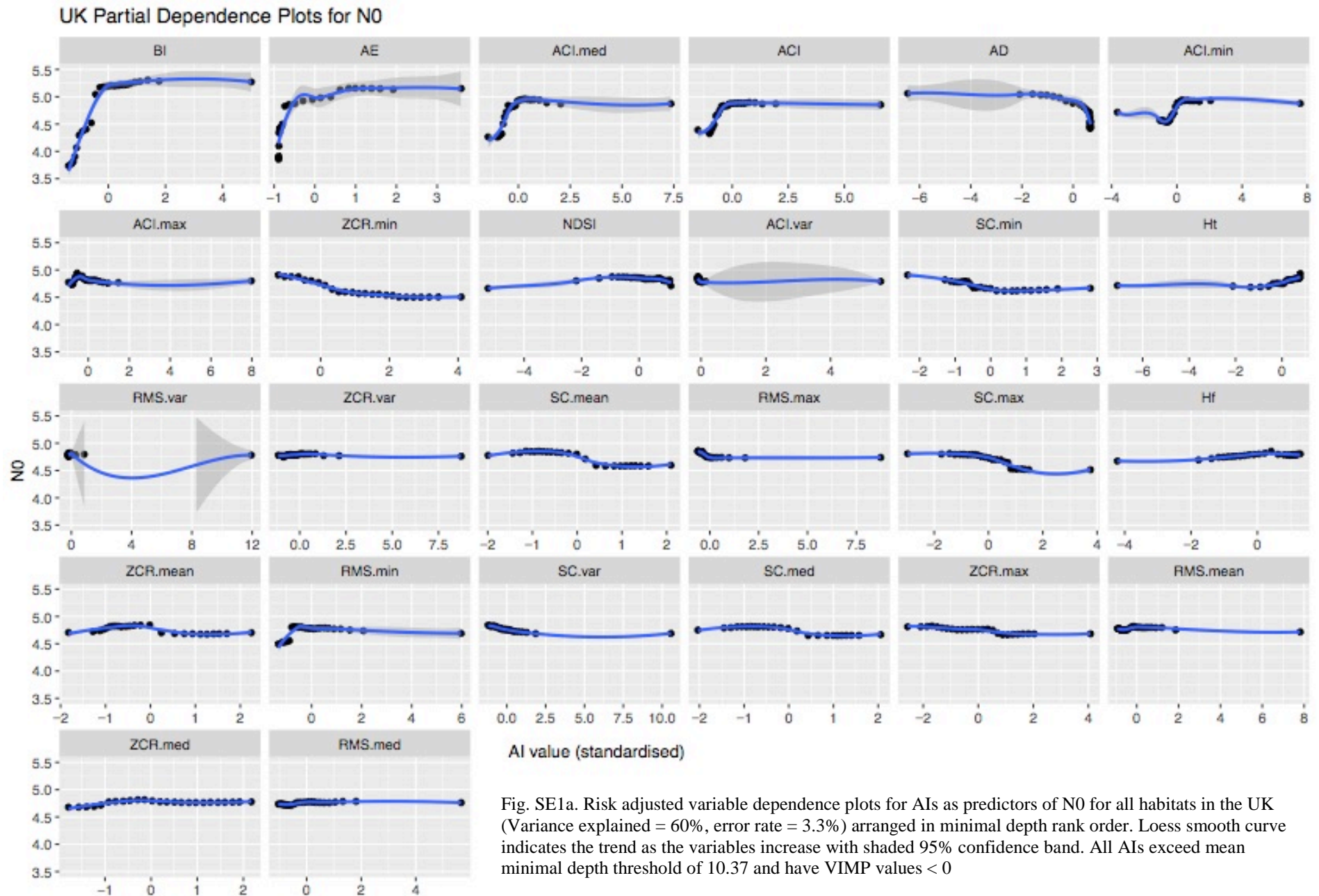


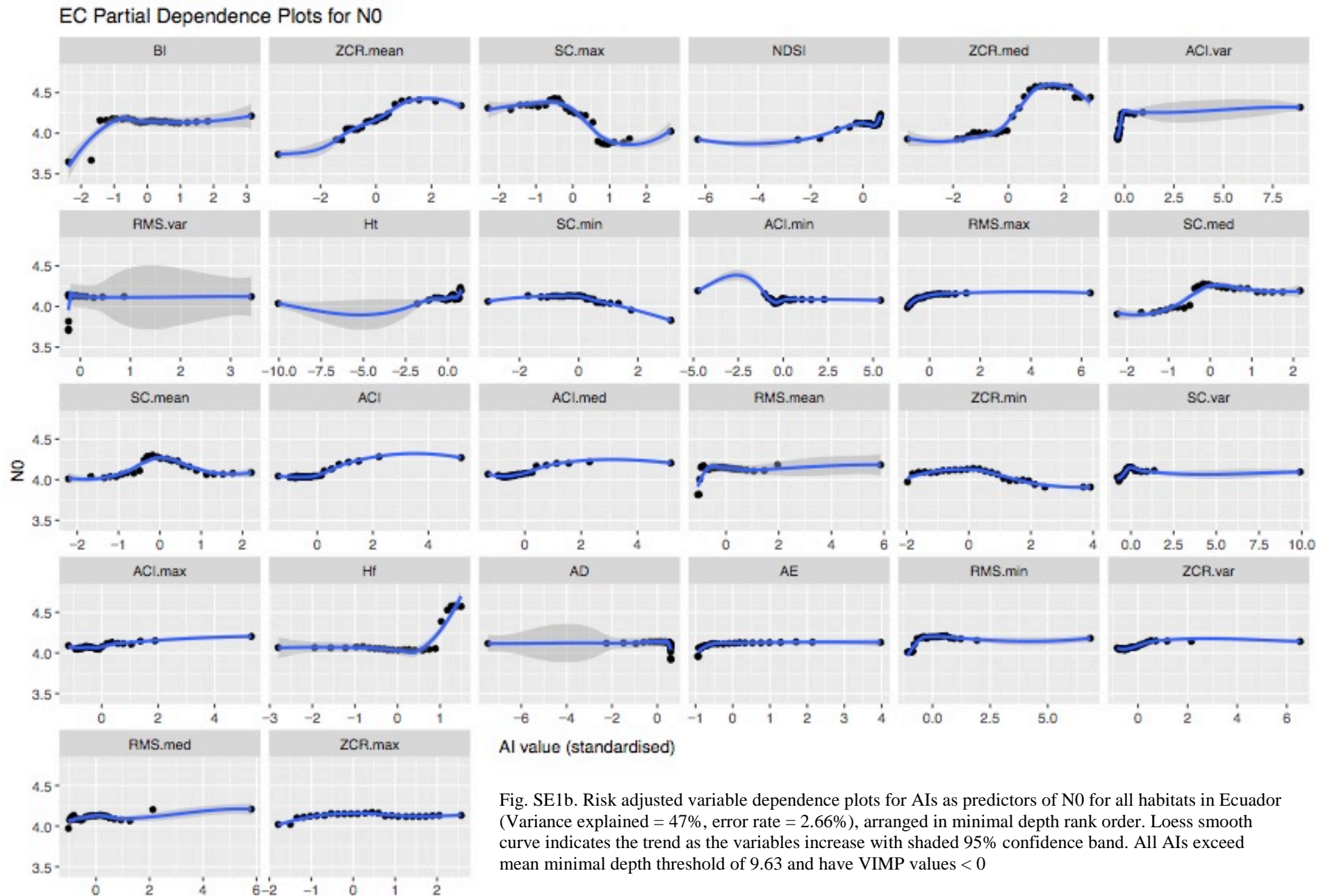
Fig. SD2a. Scatter plots of standardized AI values against species richness for all EC sites combined. Data are fitted with a loess curve (blue) with 95% confidence interval (grey).



SUPPLEMENTARY MATERIALS E



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SUPPLEMENTARY MATERIALS E

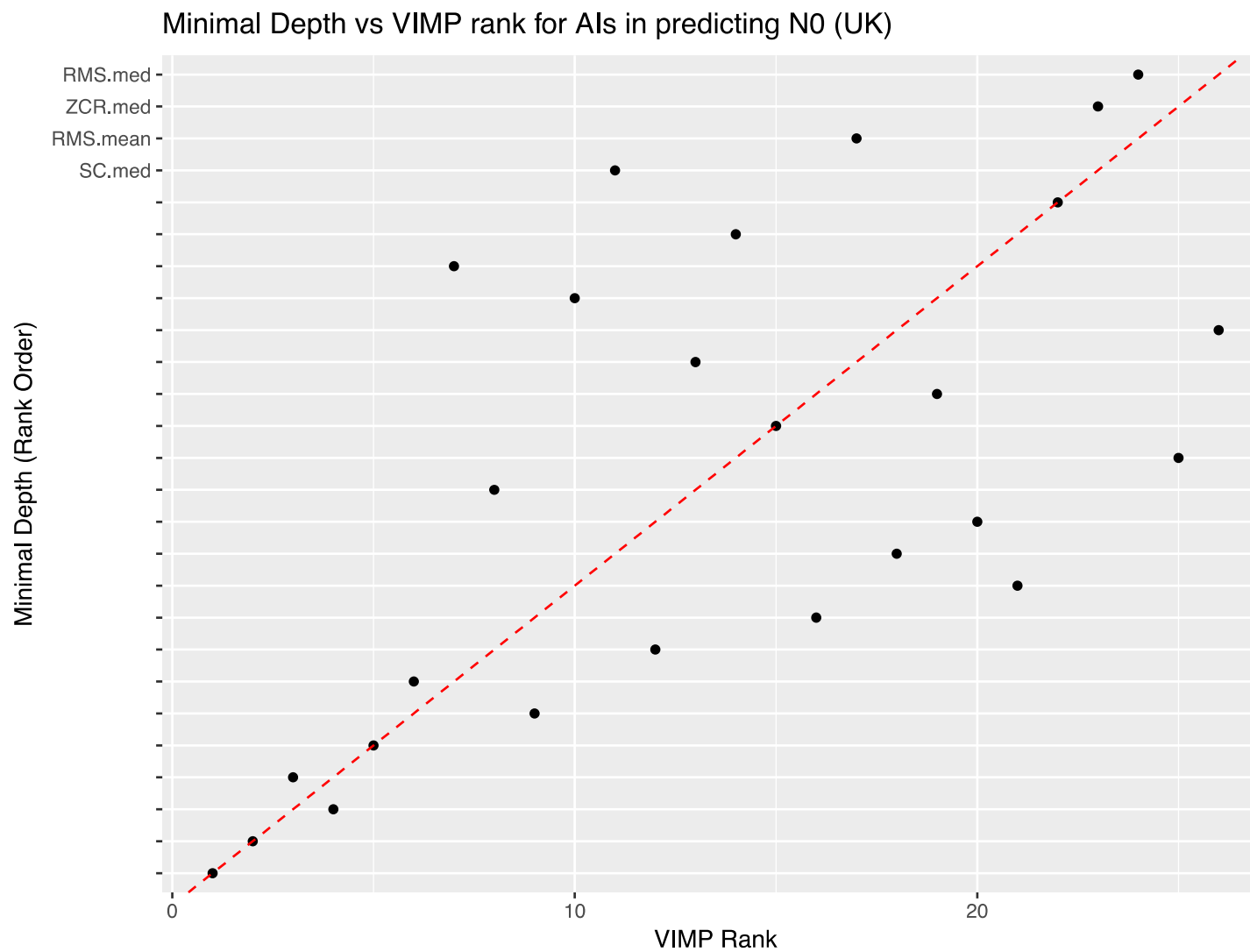


Figure SE2a. Minimal Depth against Variable Importance (VIMP) for AIs in predicting N0 for UK. All AIs exceed mean minimal depth threshold of 10.37 and have Variable Importance Values > 0

SUPPLEMENTARY MATERIALS E

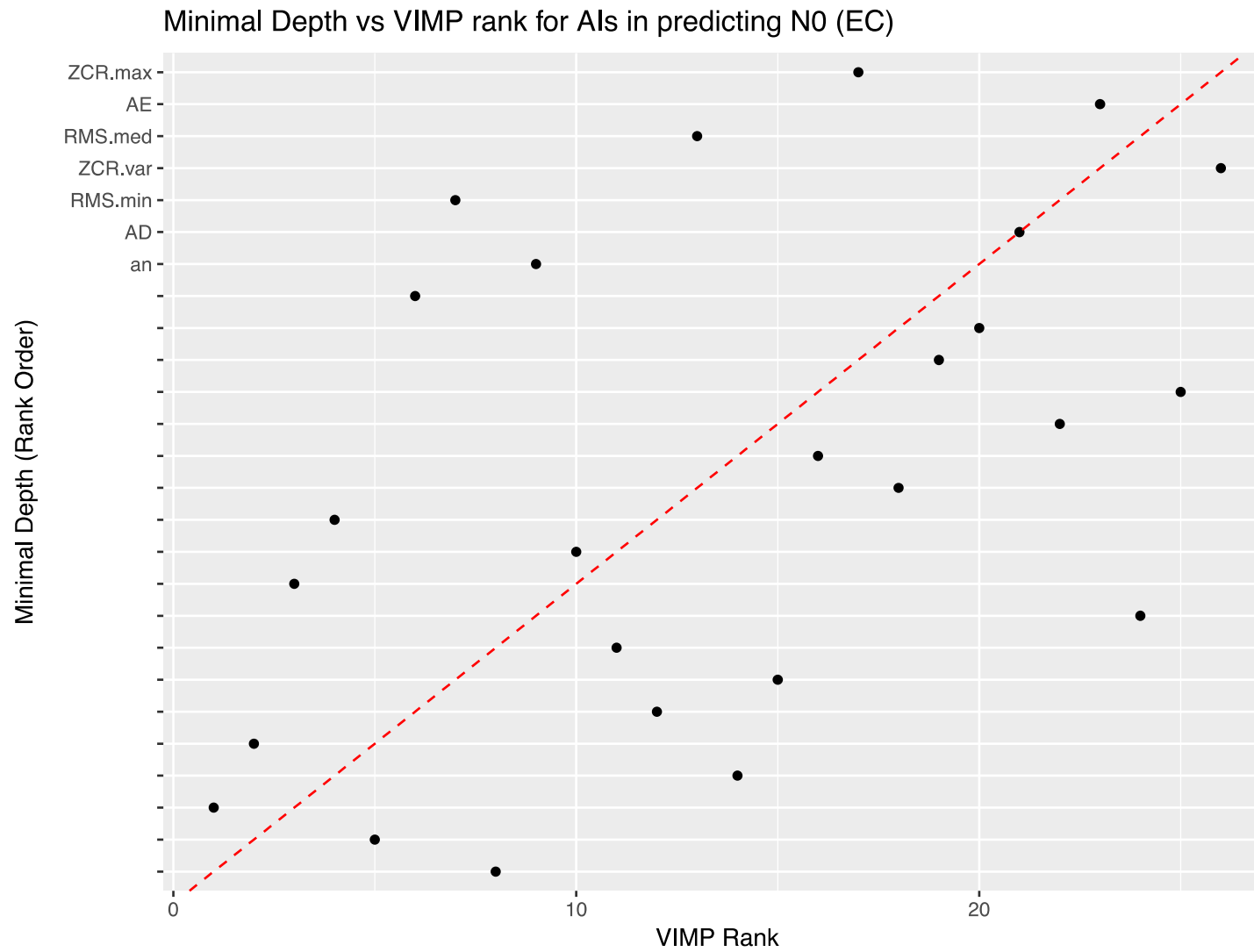


Figure SE2b. against Variable Importance (VIMP) for AIs in predicting N0 for Ecuador. All AIs exceed mean minimal depth threshold of 9.63 and have Variable Importance Values > 0