Supplementary information

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Figure S1. The distribution patterns of the unclassified and classified OTU at the phylum level across the samples. OTUs have been sorted into bins based on their prevalence in the samples (X-axis). Y-axis is the count of OTUs in each bin.

Figure S2. PCoA analysis of the weighted UniFrac dissimilarities comparing baboon gut microbiota. Each point corresponds to a sample colored by (A) individual identity, (B) sex, (C) ageclass and (D) season, (E) diet group. Baboons with diet composition information (n = 76) were divided into 3 diet groups by the relative abundance of grass, fruit and invertebrate in their diet guided by the PCoA plot of diet Bray-Curtis dissimilarity: 1. Fruit, if fruit percentage is >=20%; 2. Invertebrate, if there is invertebrate in diet; 3. Grass, if grass percentage is >=70%.

Figure S3. The first principal coordinate of variation in diet composition (diet PC1) as a function of the 11 primary diet components (Table S3). Blue lines represent lowess regression fits. PC1 explained 46% of the variation in diet composition and is associated with a tradeoff in the proportion of grass (-) versus fruit (+) in the baboons' diets.

Figure S4. The second principal coordinate of variation in diet composition (diet PC2) as a function of the 11 primary diet components (Table S3). Blue lines represent lowess regression fits. PC1 explained 23% of the variation in diet composition and is associated with a tradeoff in proportion of insects (-) versus fruit (+) in the baboons' diets.

Figure S5. The third principal coordinate of variation in diet composition (diet PC3) as a function of the 11 primary diet components (Table S3). Blue lines represent lowess regression fits. PC1 explained 11% of the variation in diet composition and is associated with the proportion of the diet attributed to 'unknown' categories (-).

Supplementary tables

Table S1. Sample size information, including the number of individuals and fecal samples used in analyses of the dataset rarefied to 3,000 reads.

Individual	Sex	Number of samples	Range of years samples were collected	Age range or age at time of sample collection (years)
BEAM	M	9	1994 - 2001	5.95 - 13.16
DUNLIN	F	8	1996 - 1997	0.72 - 1.56
OCEAN	M	5	1997 - 2000	0.6 - 3.78
OKOT	M	5	1996 - 1998	1.32 - 2.81
VANGA	M	5	1995 - 1998	3.05 - 6.05
DRONGO	F	3	1996 - 1997	6.99 - 8.09
GOLON	M	3	1997 - 1999	19.19 - 20.63
LAWYER	M	3	2001 - 2001	1.19 - 1.98
HONEY	F	2	1999 - 2000	1.85 - 2.75
LEBANON	M	2	1998 - 2000	1.57 - 3.21
OXYGEN	F	2	2001 - 2001	1.62 - 2.16
VIXEN	F	2	1994 - 1997	17.06 - 19.97
DYNAMO	M	1	1998	0.94
ECHO	F	1	1997	5.88
HEKO	F	1	1997	14.27
LARK	F	1	1997	9.71
VOGUE	F	1	1998	1.08

Table S2. Unweighted UniFrac dissimilarity comparison within and between mammalian orders or diet types.

Group	Average within group dissimilarity	Average between group dissimilarity	*P* value (Wilcoxon rank sum test)
Order	0.80	0.86	2E-16
Diet type	0.82	0.87	2E-16

Table S3. Diet items included in each diet category.

Diet category	Diet item
Grass	Grass corms (all species)
	Grass leaves (all species)
	Grass blade bases (all species)
	Grass seed head (all species)
Gum	Gum from *Acacia xanthophloea*
Leaves	*Lyceum sp.* leaves
	Azima tetracantha leaves
	Acacia xanthophloea leaves
	Salvadora persica leaves
	Suaeda monoica leaves
	Tribulus terrestris leaves
Fruits	*Trianthema ceratosepala* fruits
	Azima tetracantha fruits
	Abutelon sp. fruits
	Lyceum sp. fruits
	Ramphicarpa montana fruits
	Salvadora persica fruits
	Solanum dubium fruits
	Tribulus terrestris fruits
	Withania sp. fruits
Blossoms	*Acacia xanthophloea* blossoms
	Ramphicarpa montana blossoms
	Acacia tortilis blossoms
Bark	Bark from *Acacia xanthophloea*
Pods	Fresh, green seed pods of *Acacia* spp.
Seeds	Dried seeds of *Acacia* spp.
Invertebrates	Invertebrates of unknown species
Dung	Liquid from or items in elephant dung
Unknown	Unknown diet items (i.e. those that could not be seen by observers)

Table S4. CCA analysis of environment and host factors for the 3,000 read dataset.

Dataset	Number of samples	Factors tested	Best model at		
			phylum level	genus level	OTU level
Full dataset	54	age, rainfall, sex, individual ID, social group, natal social group, group size	rainfall (P=0.12), age (P=0.13)	rainfall (P=0.09)	None
Subset with diet diversity info	38	age, rainfall, sex, diet diverisity (richness, Shannon's H or PCoA axis), individual ID	None	rainfall (P=0.08), diet PC1 (P=0.05),	None

Table S5. Best-supported generalized linear mixed model (Poisson-link) explaining variation in abundance of the four most common bacteria phyla for the subset of 76 samples with diet data. Individual identity is a random effect in all models.

Bacteria phylum	Fixed effect	estimate	S.E.	Z	p-value
Actinobacteria	rainfall	-0.005	0.000	-15.126	<0.001*
	diet PC1	0.248	0.041	6.086	<0.001*
	diet PC2	1.858	0.113	16.403	<0.001*
	diet PC3	1.981	0.097	20.365	<0.001*
Bacteroidetes	rainfall	-0.002	0.000	-5.101	<0.001*
	diet PC1	-0.849	0.073	-11.70	<0.001*
	diet PC2	-0.537	0.106	-5.048	<0.001*
	diet PC3	1.044	0.161	6.471	<0.001*
Firmicutes	age	-0.006	0.002	-2.68	0.007*
	rainfall	0.001	0.000	13.53	<0.001*
	diet PC1	-0.578	0.026	-22.60	<0.001*
	diet PC2	-0.770	0.034	-22.57	<0.001*
	diet PC3	-0.549	0.056	-9.78	<0.001*
Proteobacteria	age	0.041	0.011	3.91	<0.001*
	diet PC1	3.270	0.071	46.00	<0.001*
	diet PC2	-0.706	0.089	-7.96	<0.001*

Table S6. Mantel test of correlation between sampling time interval and microbiota weighted Unifrac dissimilarity between samples that were collected from the same individual.

Individual	Number of samples	Mantel *r* statistic	*P* value
BEAM	10	-0.04	0.882
DUNLIN	10	-0.03	0.899
OKOT	10	0.40	0.095
OCEAN	8	-0.27	0.263
VIXEN	8	0.11	0.696
DRONGO	7	0.23	0.452
ECHO	7	-0.41	0.180
VANGA	7	0.61	0.038*
GOLON	6	-0.17	0.692
LAWYER	6	0.25	0.365
OXYGEN	6	0.10	0.792
HONEY	3	-0.64	0.481

Fig S1

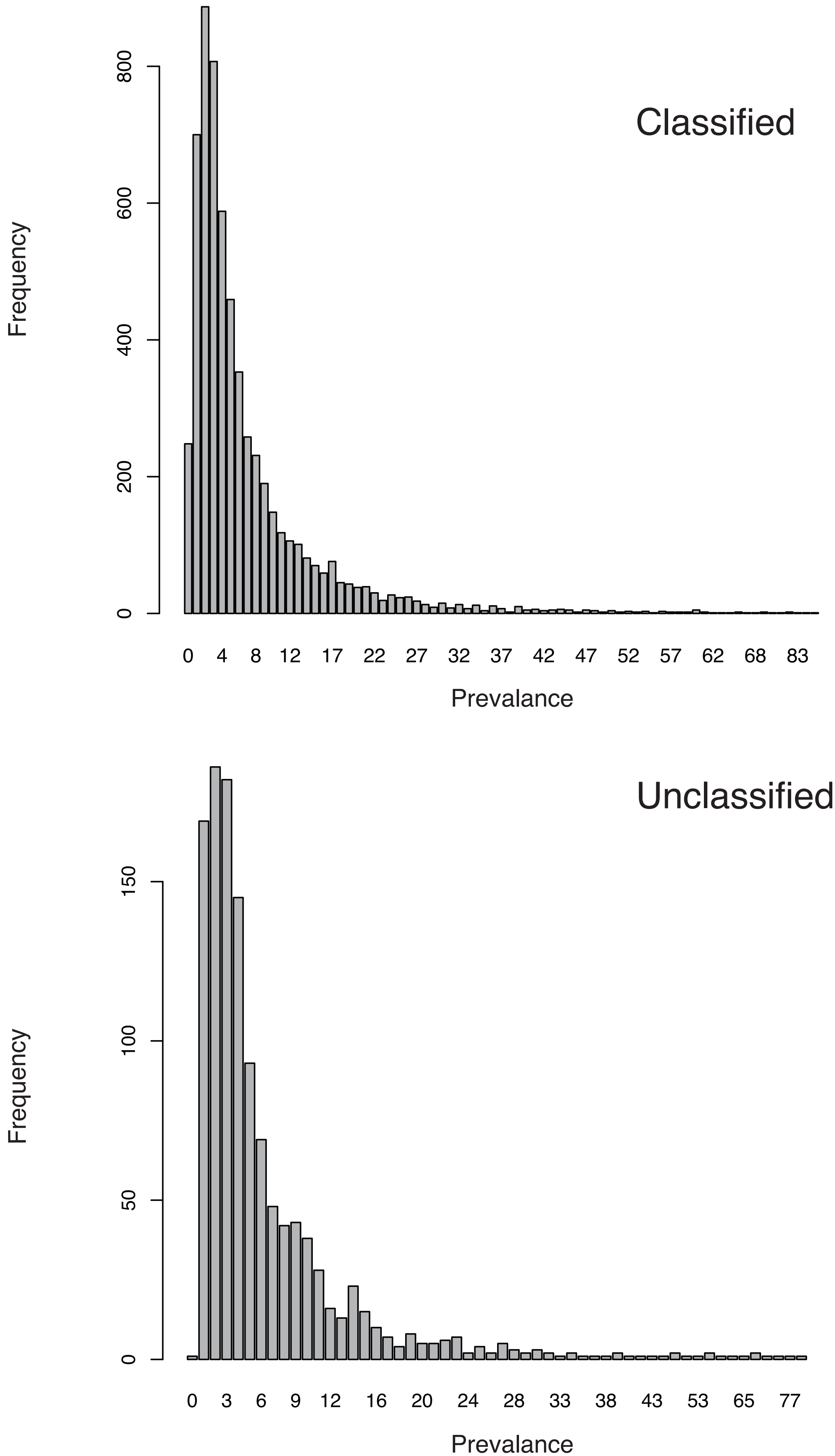

Classified
Frequency
0
200
400
600
800
0 4 8 12 17 22 27 32 37 42 47 52 57 62 68 83
Prevalance
Unclassified
Frequency
0
50
100
150
0 3 6 9 12 16 20 24 28 33 38 43 53 65 77
Prevalance

Fig S2

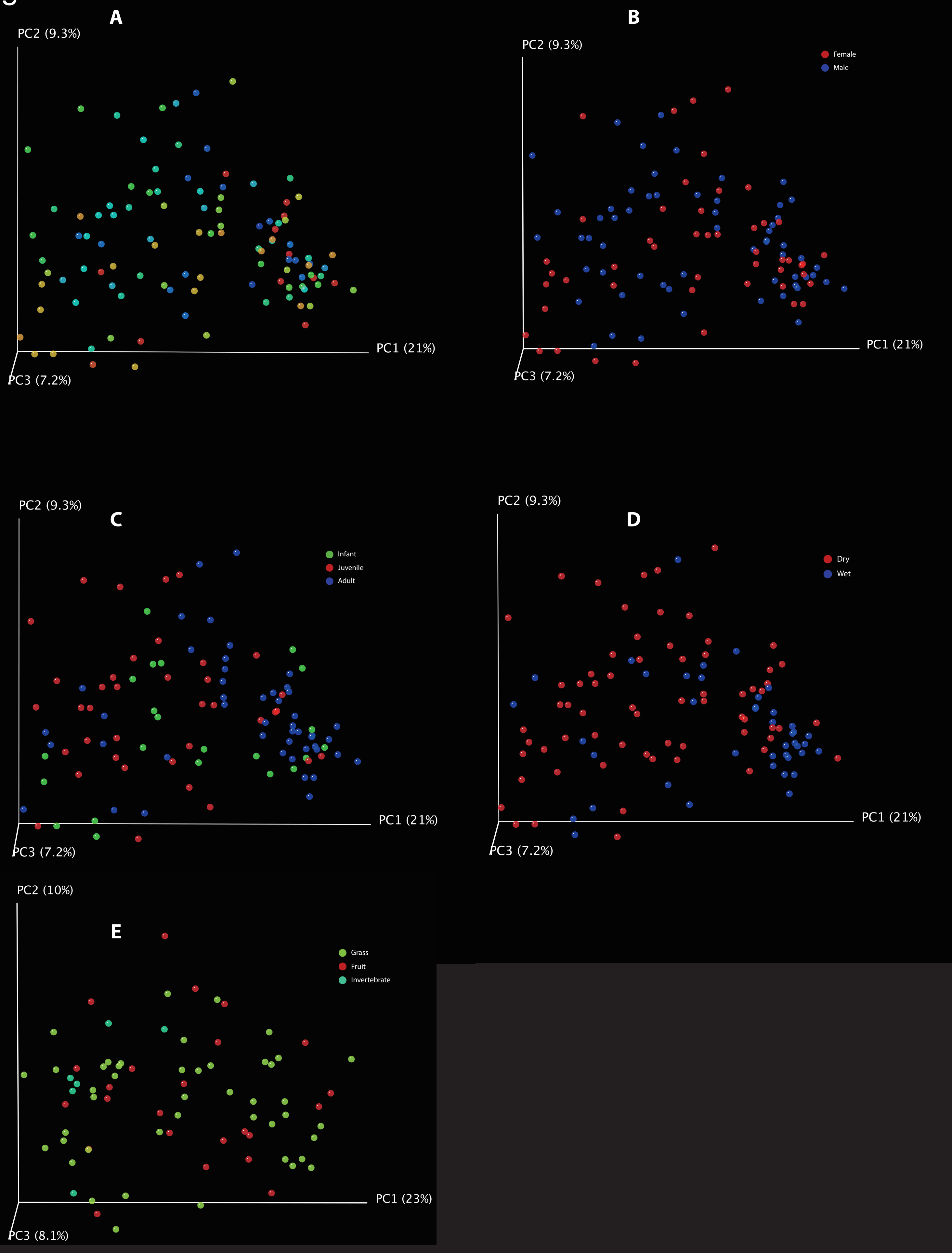

A
PC2 (9.3%)
PC1 (21%)
PC3 (7.2%)
B
PC2 (9.3%)
Female
Male
PC1 (21%)
PC3 (7.2%)
C
PC2 (9.3%)
Infant
Juvenile
Adult
PC1 (21%)
PC3 (7.2%)
D
PC2 (9.3%)
Dry
Wet
PC1 (21%)
PC3 (7.2%)
E
PC2 (10%)
Grass
Fruit
Invertebrate
PC1 (23%)
PC3 (8.1%)

Fig S3

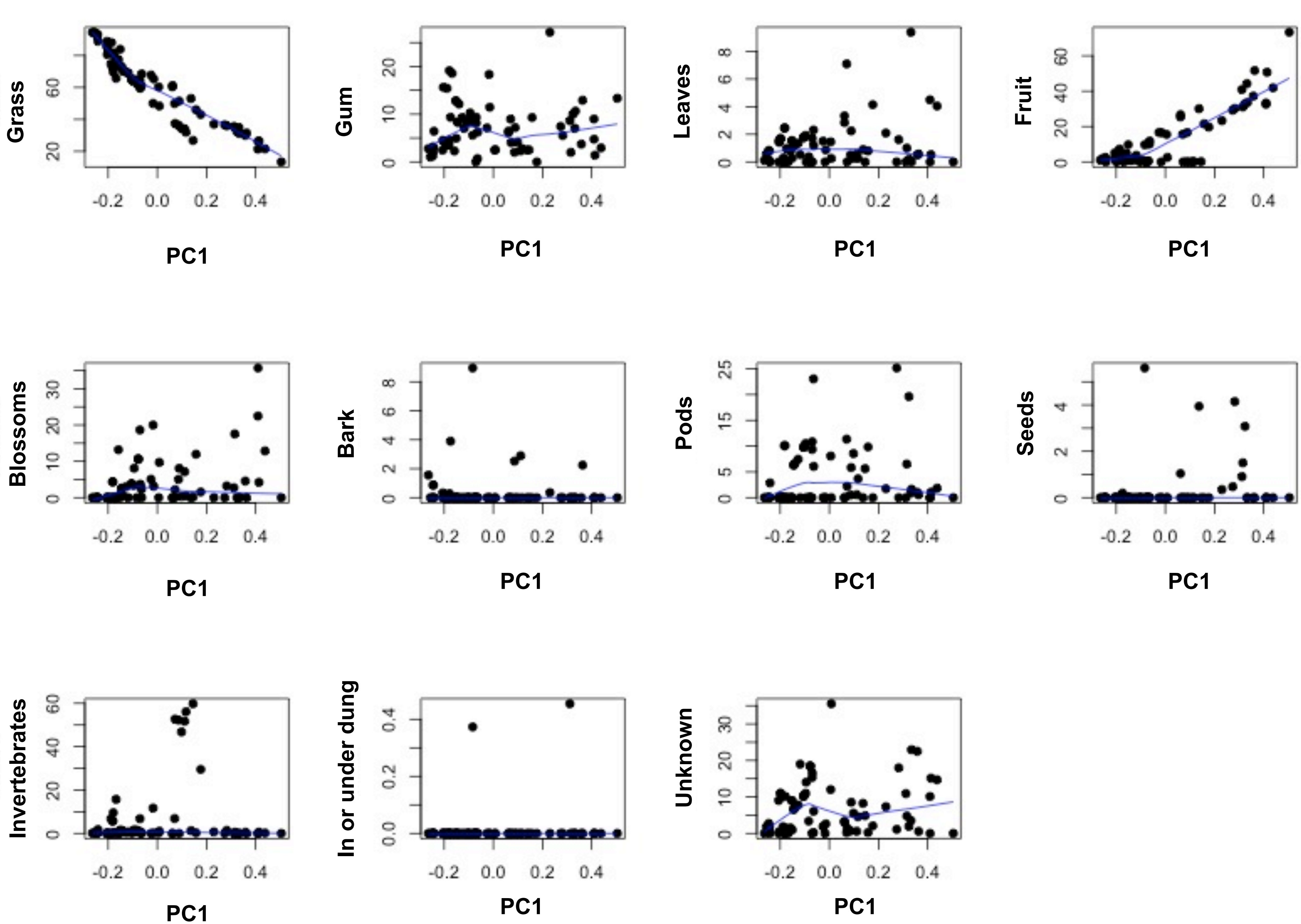
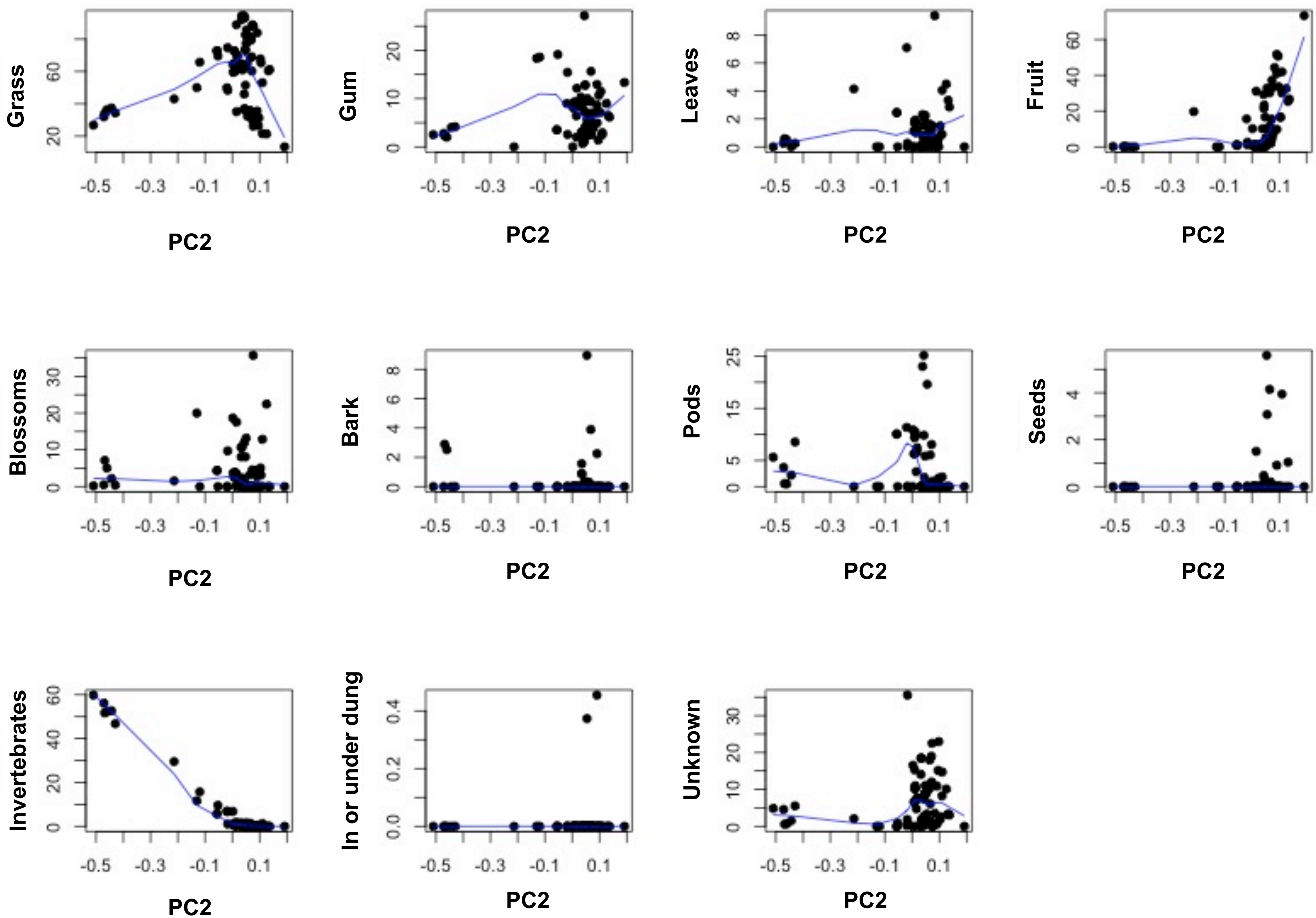
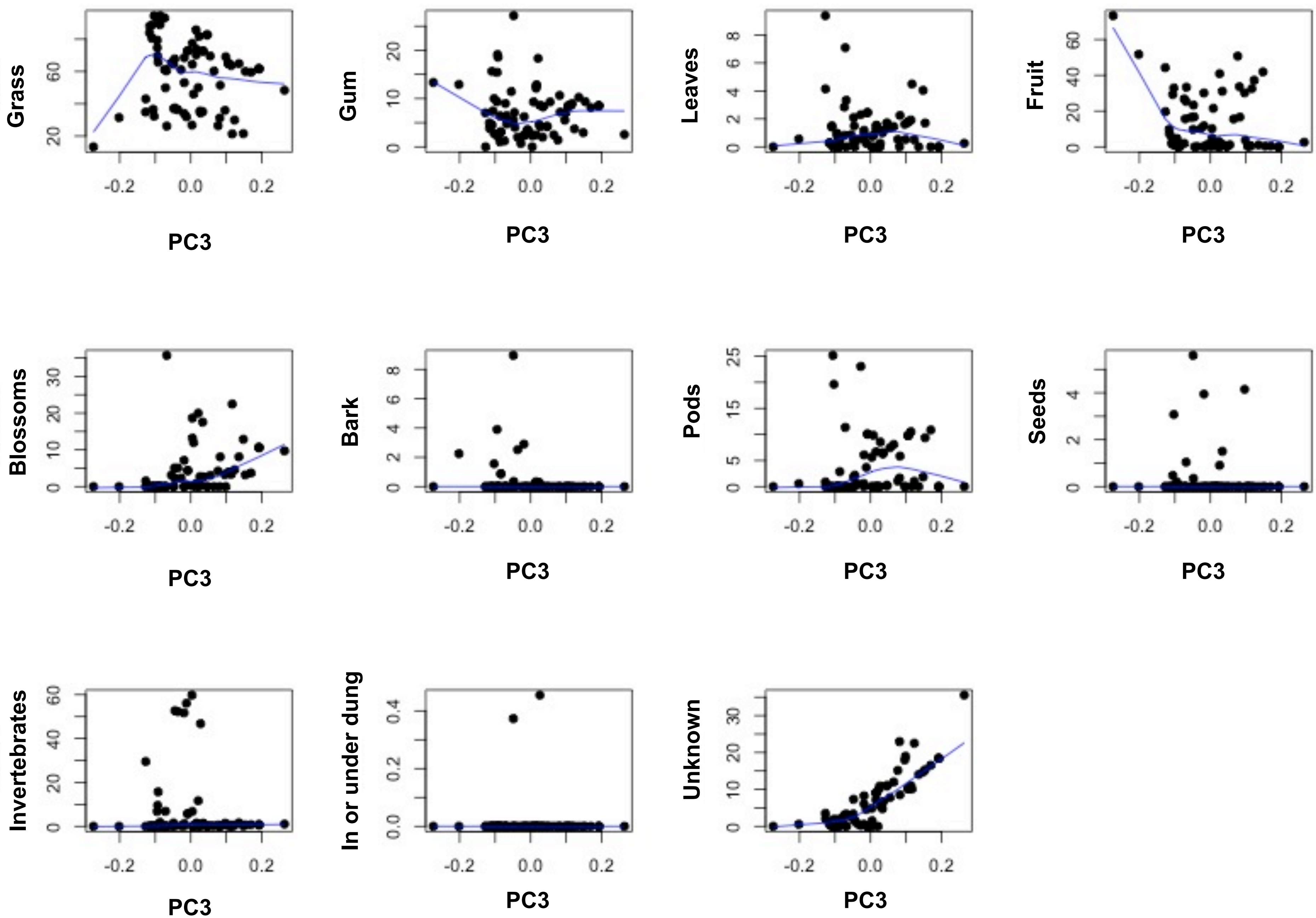

Grass
Gum
Leaves
Fruit
Blossoms
Bark
Pods
Seeds
Invertebrates
In or under dung
Unknown
PC1
-0.2 0.0 0.2 0.4

Fig S4



Grass
Gum
Leaves
Fruit
Blossoms
Bark
Pods
Seeds
Invertebrates
In or under dung
Unknown
PC2
-0.5
-0.3
-0.1
0.1

Fig S5



Grass
Gum
Leaves
Fruit
Blossoms
Bark
Pods
Seeds
Invertebrates
In or under dung
Unknown
PC3