

E. B. FORD, F.R.S.
University Reader in Genetics
and Director of the Genetics Laboratory.

GENETICS LABORATORY
DEPARTMENT OF ZOOLOGY
UNIVERSITY MUSEUM, OXFORD
TELEPHONE 55726

Sir Ronald Fisher, F.R.S.,
44 Storey's Way,
Cambridge.

30th January, 1957.

My dear Ron,

I am sending you herewith some moderately extensive Primula data which I hope you may care to see. It has been obtained by my friends and myself.

I should be very grateful for your views upon Crosbie's article in Evolution, Volume 3, in which he goes into the whole matter pretty thoroughly, naturally quoting yourself a good deal and, I am pleased to see, making use of some of the Sparkford data which you obtained in a number of years, including 1943 and 1944 when I had the pleasure of collecting some of them with you. There is obviously much in this paper with which one will be in entire agreement, but I must say that I cannot myself agree with some of the more general conclusions.

Of course, his proposition that selection, having very different effects in different life-stages, here gametophyte and sporophyte, may reduce average survival value is obviously true, and one we have long known and discussed. For instance, one which Julian and I discussed many years ago is that of genes speeding up development in mammals with embryonic competition, whereas in the mouse the number of early embryos is greater than the uterus could contain at full term, genes giving increased rate-average then could be selected for, even if fairly disadvantageous later on.

Crosbie gives the impression that he believes that homostyles are spreading outwards from a centre in the two known areas where they are common; that is to say, Sparkford and the Chilterns. He also gives the impression, indeed specifically states, that this is due to the origin of homostyles (by crossing-over within the super-gene) in those areas; that is to say, that the species has had to wait for the occurrence of homostyles which would then promptly begin to sweep through it. He goes on further to remark that, from these centres, homostyles will probably spread throughout Britain, causing species to pass from the homostyled to the heterostyled condition in this country.

This is in itself manifestly incorrect; for, as the data I am now sending you show, the Primrose has not had to await the rare occurrence of homostyles in two places only, and promptly to

make use of them. They are widespread at a low frequency in many Primrose populations.

Nor do the historical facts of the Primula species support him. Obviously, Primula scotica is a slight adjustment of Primula farinosa at the edge of its range; such adjustments being what one would expect when species are to maintain themselves in the relatively unsuitable conditions at the extreme edge of their territory. Having made these adjustments, Primula scotica has become homostyled, but Primula farinosa has not. This has, no doubt, been aided by the polyploidy of scotica.

They Surely the situation over the British countryside is in a state of flux and, relatively recently, has passed through vast changes from the primeval condition and, very recently indeed, through the changes of the enclosures and, recently, alterations in agriculture and silviculture. The ecological requirements of this will differ immensely from one part of England to another, and will have differed immensely, temporarily as well as spatially. Thus, in some places, it will pay the Primrose to be an inbreeding plant with accurate adjustment and little or no plasticity, and in others an outbreeding plant with much greater plasticity. The Primrose, in its heterostyle-homostyle mechanism, has the possibility of adjusting itself to either set of circumstances, and I do not believe will spread from these two areas throughout Britain merely because homostyles have occurred in them.

Questionless, Mr. Crosbie is correct in saying that, where the homostyle frequency is high, there will be improvement of the homozygote by selection. There is a point which has been missed in all these discussions. Crosbie is stressing that in such circumstances a gene lowering survival value (i.e. of the sporophyte) has become common. Yet, as Darlington has pointed out, the majority of plants produce enormously more fertile seeds than are needed to maintain them. In an outbreeding species the reduction of their number would be serious because it would reduce the range of genetic variability upon which natural selection could act. But this is not true in an inbreeding form, where moderate genetic variability is nearly absent, so that a reduction in fertility will not affect survival-value of the sporophyte.

Crosbie mentions that pins are normally slightly commoner than thrums in wild populations. Surely this may be the adjustment necessary to produce the correct backcrossing with the slight unequal viability of the two forms.

I should be so grateful, my dear Ron, for your own views on this matter.

Sir Ronald Fisher, F.R.S.

30th January, 1957.

Our own work upon population studies in the Meadow Brown butterfly has reached a stage so extraordinarily exciting and remarkable, with results so far reaching, that I dare not discuss them until they have been confirmed by a further season's work. I will then put the matter to you if, as on the one hand I believe, but on the other I can scarcely credit, they will be substantiated another year.

Alas, I am in a most nasty pickle. My housekeeper will be away many weeks with a major operation. I have myself to run the house in every respect, and it seems that I am an Estate Agent, an Archaeologist and a Zoologist only in the minutes I can spare. Worse still, I cannot go away for, if I do so, the big furnace which runs the central heating etc. will survive only about a day without me, and I come back to the enormous job of restarting it. It is like a ship's boiler on a liner.

Did I mention to you that, on the archaeological front, good fortune has been with me by the discovery of the first la Tène sculpture to be found in Britain? What really gives me great pleasure is that this find is quite comparable to that of the Stonehenge carvings: that is to say, the sculpture is in a monument which has been carefully studied by archaeologists in large numbers for two hundred years, and it is in the most conspicuous position in that monument!

Ever yours,

A handwritten signature in cursive script, appearing to read "Henry", with a horizontal line underneath.

Primula 1952.

	<u>Homostyle</u>	<u>Thrum</u>	<u>pin</u>	<u>Total</u>
<u>Cornwall</u>				
Pendeen	2 2	105 68	80 63	185 151
<u>Devon</u>				
Stoke Gabriel	0	44	59	103
Buccombe	2	47	53	102
	2	91	112	205
<u>Somerset</u>				
Wedmore	2	57	66	125
Aisholt, Quantocks	2	47	52	101
	4	104	118	226
<u>Suffolk</u>				
Rayden (middle of wood)	8	138	155	301
Rayden Wood (edge)	1	156	229	386
Brimlin Wood	3	59	88	150
Great Glesham	1	82	79	162
Ashbocking	0	63	87	150
Bentley Railway Embankment	0	43	57	100
Bentley Wood	1	41	60	102
Elmset	1	165	185	351
Bentley Long Wood	3	113	134	250
Hintlesham Great Wood	0	191	209	400
Barking	2	88	110	200
Assington	2	97	101	200
Bruisyard	2	196	262	460
	24	1422	1756	3211

Primula 1954.

	<u>Homostyle</u>	<u>Thrum</u>	<u>pin</u>	<u>Total</u>
<u>Somerset</u>				
Quantocks N.	4	131	134	269
Lilstock	0	61	41	102
Ivythorn	0	99	127	226
High Kam	1	445	446	892
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	5	736	748	1489
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<u>Cornwall</u>				
Pendeen	3	49	48	100
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<u>Suffolk</u>				
Bentley Wood	0	91	109	200
Bentley Wood Edge	0	91	109	200
Elmset	0	192	206	398
Hintlesham	0	95	105	200
Frimlin Wood	0	94	106	200
Rayden Wood	0	42	58	100
Ashbocking	0	67	57	124
Barking Wood	0	231	272	503
Freshingfield	0	147	153	300
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	0	1050	1175	2225
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PRIMROSES - 1955.

		<u>Homostyle</u>	<u>Thrum</u>	<u>Pin</u>	<u>Total</u>
<u>SUFFOLK.</u>					
6/4/55	Rayden, Middle	8	138	155	301
1/5/55	Rayden (Edge)	1	156	229	386
6/4/55	Wimlin Wood	3	59	88	150
9/4/55	Great Glenham	1	82	79	162
10/4/55	Ashbocking	0	63	87	150
11/4/55	Bentley (Railway Embankment)	0	43	57	100
1/5/55	Bentley Wood	1	41	60	102
12/4/55	Wimsett Park Wood	1	164	185	350
13/4/55	Bentley Long Wood	3	113	134	250
13/4/55	Wimtleham Great Wood	0	191	209	400
16/4/55	Barking	2	88	110	200
30/4/55	Assington	2	97	101	200
30/4/55	Bruisyard	2	196	262	460

24	1431	1756	3211
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CORNWALL.

16/5/55	Pendeen	2	105	89	196
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SOMERSET.

23/4/55	Wedmore (isolated patch in calcareous district)	2	57	66	125
25/4/55	Aisholt (Quantocks)	2	47	52	101

4	104	118	226
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PRIMROSES, 1956.

		<u>Homostyle</u>	<u>Thrum</u>	<u>pin</u>	<u>Total</u>
<u>SUFFOLK.</u>					
28/3/56	Raydon Wood towards railway bridge	0	35	36	71
	" " near pig field	1	15	22	38
5/4/56	Fruisyard Wood	0	227	287	514
8/4/56	Elmsett Park Wood	0	146	232	378
15/4/56	Barking Woods	0	187	213	400
20/4/56	Bentley Long Wood	0	98	102	200
21/4/56	Bentley Woods (Belstead)				
	Railway embankment	1	39	60	100
	Edge of wood by pond	1	35	64	100
22/4/56	Ashbocking	1	47	52	100
	Assington Thicks	0	78	68	146
23/4/56	Hintlesham Great Wood	1	171	181	353
26/4/56	Brimlin Wood	4	102	94	200
27/4/56	Great Glemham	6	87	107	200
28/4/56	Raydon Wood towards railway bridge	5	198	197	400
	" " near pig field	0	88	112	200
		20	1553	1827	3400
<u>KENT</u>					
15/4/56	Shipbourne	0	157	185	342
<u>SURREY</u>					
22/4/56	Ockley, near Dorking,	0	57	84	141
<u>SOMERSET</u>					
23/4/56	Parley Hungerford (isolated colony)	0	39	35	74
29/4/56	Folden Hills near Chapwick (isolated colony)	1	54	59	114
		1	93	94	188
<u>CORNWALL</u>					
/5/56	Pendeen	3	163	145	311