

THE LUNDY NORTH DEVON CATTLE: AN INSIGHT INTO THEIR SOCIAL BEHAVIOUR

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A series of observational studies were carried out on the Lundy North Devon cattle in 1991 and 1992 in order to investigate their social relationships. Using this information, the traditional concept of 'dominance order' was evaluated and subsequently rejected. Individual preferences, associations, differences and personality profiles were investigated as alternatives.

The overall conclusion was reached that dominance orders fail to account for all of the social behaviour observed. Furthermore individuals showed marked preferences for associates, and differences in personality.

INTRODUCTION

North Devon cattle are one of Britain's oldest native breeds, originating from Exmoor, North Devon. They are therefore accustomed to a wet and humid climate, cold, rough winters and an exposed environment. The breed is described as 'fine-boned, fine-limbed, hardy and agile' - characteristics which makes it suited to the moorlands and uplands of Devon - and also Lundy (Plate 1). The North Devon is considered to be a dual-purpose breed, despite originally being bred for draught work. It is noted for its ability to convert poor grazing into excellent beef and also for the creamy quality of the milk (Porter 1991, 64). The cows are early maturing, fertile and easy calving (The Natural Cattle Breeds Association handbook, 1980, 68) with a docile temperament and excellent mothering ability. (The two latter attributes have been made use of in the summer of 1992 when two of the dams successfully adopted friesian cross calves, to the extent that supervision was not necessary and the calves ran with and suckled freely on their adoptive dam. (For further information on adopting in Devon cattle see Randle, in prep.).



Plate 1: Showing Burwood Beauty 15th. Note the typically curly 'ruby-red' coat.

The Lundy North Devons have been on the island since the summer of 1990 and originate from two different herds. Four were from *Burwood* herd (the oldest North Devons) and four from the polled *Clampit* herd. All arrived at two years of age in calf to *Burwood Commander*. One of the *Clampit* cows (L21) failed to calve and was culled, however the remainder have had their second calves (sired by *Burwood Dictator*) and are now pregnant for the third time.

Over the first two years a series of studies have been carried out on the Lundy cattle. In April 1991 the social activities of the North Devons in calf for the first time, were investigated in relation to their herd of origin. These were then re-examined in April 1992. The three heifer calves born in 1991 were retained on the island along with three horned heifer calves from the mainland which formed an additional group whose social activities were also assessed in relation to their origin.

The aim of this paper is to provide a brief insight into the social behaviour of the cattle on Lundy with reference to the more traditional literature based on dominance hierarchies. Some of the newer thinking, focussing on non-aggressive behaviour, will then be introduced along with the importance of individual associations and personalities. Throughout, general findings will be presented followed by selected pieces of data to illustrate specific points.

However, first it is necessary to give a relatively brief review of the vast literature concerned with social activity in cattle, with the intention of disentangling the assumptions implicated in dominance hierarchies.

There is an inherent interest in how the social organization of these herd-living gregarious herbivores is mediated. The traditional answer to this would have been quite simply 'dominance orders/social hierarchies', (eg. Guhl 1969), defined as an "outward manifestation of an underlying social organization principle governing all social behaviour and resources of the group". This would act to achieve stability through the partitioning of resources in the amount of aggressive behaviour. This order is determined by the outcome of aggressive encounters and then maintained by symbolic threat, giving the impression that such orders are static (eg. Hafez, Schein and Ewbank 1969; Kondo, Kawakami, Kohama and Nishino 1983). However changes in rank do occur (Reinhardt and Reinhardt 1979). Metz and Mekking (1984) conclude that crowding enhances aggression and consequently results in change in group relations. This can be taken as evidence of the flexibility of social behaviour in cattle which cannot possibly be accounted for solely by such an inflexible concept as 'dominance order'. I would argue that this is not the case since most of the aggressive interactions observed in groups of cattle typically occur at feeding sites or other such sites harbouring a resource; i.e. these postulated dominance orders do not work!

There are a few more points against the concept of dominance hierarchies. Many of them are so complex that it is not clear who is supposed to be dominating who! It is clear that the majority of the literature puts forward competition as the basis of dominance order formation. Indeed Syme (1974) pointed out that overt aggression is the primary index of dominance, this being the "undisputed priority of access to approach or withdrawal from avoidance situations"; in other words "getting what you want" - however there is very little evidence of this in cattle to date.

Friend and Polan (1978) demonstrated that competitive orders do not imply priority of access to feeding or resting sites - since high ranking individuals did not deny lower ranking individuals access (Stricklin and Gonyou 1981). Similarly Kiley-Worthington and de la Plain (1983) refer to the inadequacy of food related competitive orders as an index of dominance in cattle.

The conclusion can be made then, that competitive orders fail to explain the function of social behaviours such as grooming. They also fail to correlate with other derived competitive orders, and are therefore a doubtful index of dominance hierarchy. This then means that we must be looking beyond aggression in our examination of cattle social relations. In other words there are different orders for different types of behaviours and situations (eg. 'leaders' differ when movement is forced from when it is voluntary, personal observations).

In 1974 Estes reported that social organisation depends upon the animal's ecological niche. Similarly Kiley-Worthington (1976, 1977) suggested that social hierarchies could well be an artefact of captivity and confined conditions, whereby aggression may not reflect dominance order - but be induced by man and his husbandry systems. This leads to the suggestion that consideration of cohesive/affiliative relations may be more informative with respect to the foundation of dominance orders.

Social grooming is well documented in cattle with potential to act as a cohesive force within the herd (Albright and Arave 1981). Indeed Hall (1989) reported that social grooming precedes changes in rank in the Chillingham cattle, whilst Reinhardt and Reinhardt (1981) showed that Indian cattle preferentially direct social grooming towards offspring and siblings. Reinhardt (1979) reported that social grooming is two-way, independent of dominance relations and functions in counterbalancing aggressive interactions.

Preferences for specific members of the group have been reported in a variety of studies, for example Beilharz and Zeeb (1982), taking the form of special 'playmates', cow-calf relationships (Veissier, Amy and le Neindre 1990), inter-familial cohesion (Reinhardt and Reinhardt 1981) and bonds between siblings (Reinhardt 1979). Stricklin and Kautz-Scanavy (1984) even suggest that cattle consider all younger individuals to be cousins and all older individuals to be aunts, hence allowing the formation of non-kin bonds.

This can be taken further to include the role of individual differences and personalities in herd integration and therefore stability. In a study of captive antelope, Kiley-Worthington (1978) showed that some behaviours rank independently of dominance hierarchies and pointed out the importance of individuals in social organization. She also demonstrated this with horses (Kiley Worthington 1987).

A few studies up to now have indicated that there is some role-taking in cattle; Wood (1977) for example suggested that within groups there are 'groomers' and baby-sitters'.

It is intended now to demonstrate that through this series of studies the aggressive relationships alone cannot explain the social organisation or activity of the Lundy North Devons. The relative importance of affiliation will be considered. Personality profiles and the idea of total social involvement as one aspect of individual differences will be explored.

METHOD

a SUBJECTS

1. Study 1. Eight North Devon heifers, two Devon cross cows and calves, one charollais steer.
2. Study 2. Seven North Devon cows, one Devon cross cow, one North Devon bull.
3. Study 3. Three Lundy bred North Devon heifer calves, three North Devon heifer calves from the mainland (breeding unknown).

(subject details can be found in appendix 1).

b STUDY SITE AND HUSBANDRY

Fig. 1 shows the locations of the cattle in the different studies. During all of the studies the cattle had ad lib silage and water, with a daily concentration feed at 10.00 am each day.

c MATERIALS

A wide variety of social behaviours were recorded by hand, using the codes and classification given in appendix 2.

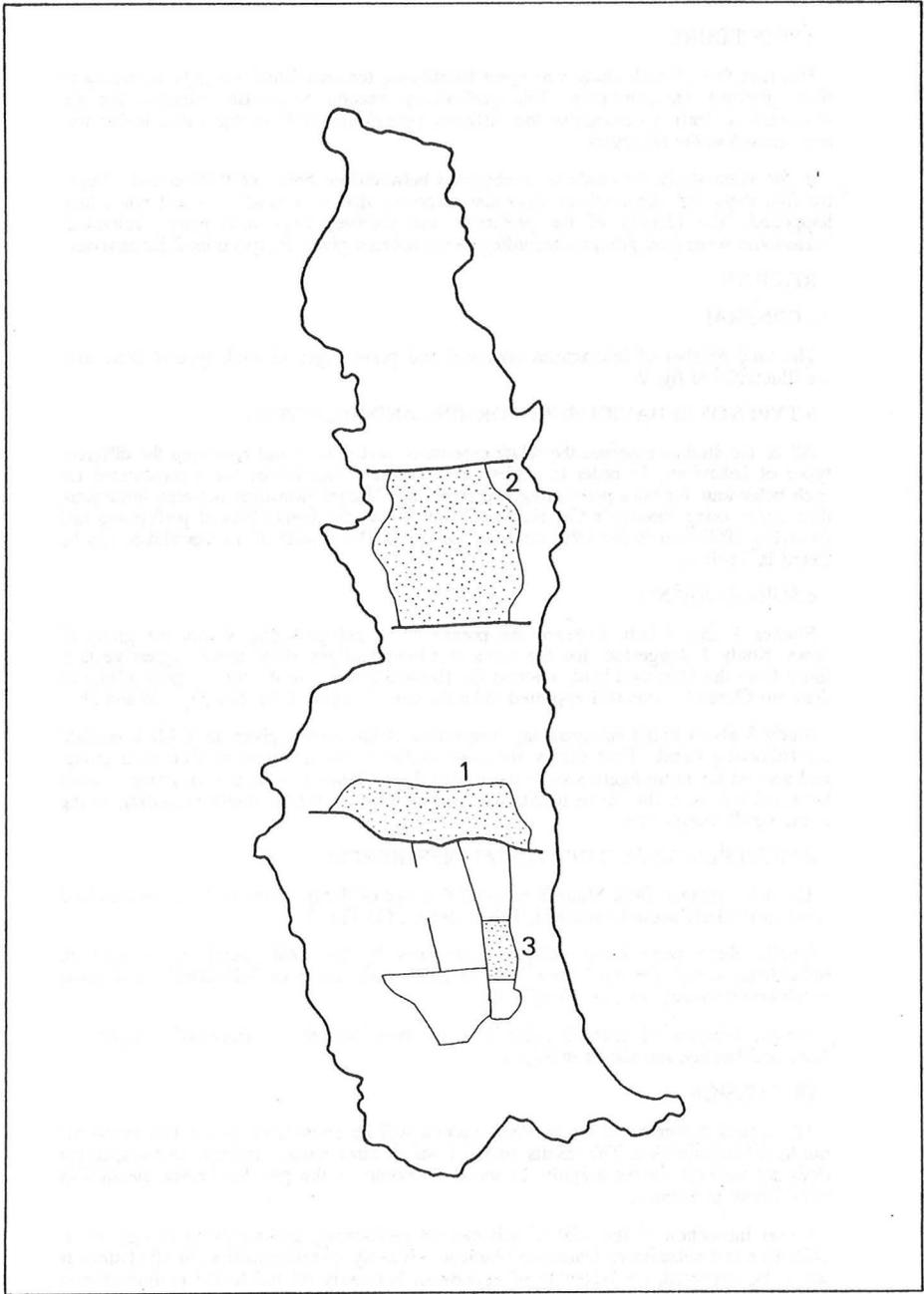


Fig 1. Location of Study Areas : 1. Cows Study 1; 2. Cows Study 2; 3. Calves Study 3.

d PROCEDURE

The first day of each study was spent identifying the individual subjects according to their physical characteristics. This preliminary session was also intended for the observers to learn to recognise the different behaviours and for the cattle to become accustomed to the observers.

In the main study the cattle were observed between the hours of 9.00am and 4.00pm for five days. All observations were instantaneous, that is, recorded as and when they happened. The identity of the performer and receiver were also noted. Individual behaviours were then grouped according to the schema given in appendix 2 for analysis.

RESULTS

a GENERAL

The total number of interactions observed and percentages of each type of behaviour are illustrated in fig. 2.

b TYPES OF BEHAVIOUR: PERFORMING AND RECEIVING

All of the studies assessed the relation between performing and receiving the different types of behaviour. In order to achieve this, separate hierarchies were constructed for each behaviour for both performing and receiving. The relationships between these were then tested using Pearson's Correlation. Fig. 3a shows the hierarchies of performing and receiving affiliation in the 1991 study of the cows. The results of the correlation can be found in Table 1.

c SUB-GROUPING

Studies 1 and 2 both assessed the possibility of sub-grouping within the group of cows. Study 1 suggested that the cows of Clampit origin were more aggressive than those from the Burwood herd, whereas the Burwoods were on the whole more affiliative than the Clampits. This still appeared to be the case one year later. See Figs. 3a and 3b.

Study 3 also tackled sub-grouping. Inspection of the means given in Table 2 indicate the following trends. First calves are more affiliative to members of their own group, and second are more aggressive to those who do not belong to their own group. It must be noted however, that these results were not significant, which is not surprising owing to the small sample size.

d PREFERENCES AND INDIVIDUAL DIFFERENCES

The data obtained from Study 3 revealed that two of the individuals from the mainland were particularly socially attached. This is depicted in Fig. 4.

Finally there were some striking differences in the total social involvement of individuals, which persisted from 1991 to 1992. Correlation of individual's total social involvement was significant. See Fig. 5.

Further analysis of specific behaviours for two individuals, Burwood Dimple and Burwood Beauty, are shown in Fig. 6.

DISCUSSION

The results presented in the previous section will be considered in the framework set out in the introduction. The results overall from all three studies indicate that aggression does not account for the majority of social behaviour as the pro-dominance hierarchists would have us believe.

Closer inspection of the relation between the performing and receiving of aggressive, affiliative and submissive behaviours indicate a variety of relationships. In all studies, as would be expected, the receiving of aggression is closely related to the performance of submissive behaviours. However, beyond this, there do not appear to be any other clear or consistent relations with aggressive behaviour. The clear (significant) relationships are indicated in Table 1a-c by asterisks. The lack of consistency first, between years (1a and

TABLE 1

a. Pearsons correlations for study 1: cows 1991

	P(agro)	P(affl)	P(subm)	R(agro)	R(affl)
P(affl)	-0.274	-----	-----	-----	-----
P(subm)	+0.296	-0.697*	-----	-----	-----
R(agro)	+0.912*	-0.466	+0.553*	-----	-----
R(affl)	-0.274	+0.897*	-0.659*	-0.554*	-----
R(subm)	+0.646*	-0.241	-0.124	+0.309	-0.257

b. Pearsons correlations for study 2: cows 1992

	P(agro)	P(affl)	P(subm)	R(agro)	R(affl)
P(affl)	+0.352	-----	-----	-----	-----
P(subm)	-0.401	-0.679*	-----	-----	-----
R(agro)	-0.184	-0.466	+0.896*	-----	-----
R(affl)	-0.112	+0.562	-0.116	-0.155	-----
R(subm)	+0.856*	+0.707	-0.642*	+0.309	+0.106

c. Pearsons correlations for study 3: calves 1992

	P(agro)	P(affl)	P(subm)	R(agro)	R(affl)
P(affl)	+0.154	-----	-----	-----	-----
P(subm)	-0.082	+0.441	-----	-----	-----
R(agro)	-0.042	+0.563	+0.989*	-----	-----
R(affl)	+0.143	+0.896*	+0.444	+0.565	-----
R(subm)	+0.896*	+0.492	-0.089	-0.004	+0.360

* = significant at $p < 0.05$

+ means that those most (beh1) received most (beh2)

- means that those most (beh1) received least (beh2) or vice versa
the higher the value (closer to 1.00) the stronger the relationship

TABLE 2

Subgrouping between the Lundy bred- and the mainland- calves

a. Affiliative Behaviour

	Total	Mean
Ingroup	566	94.3
Outgroup	464	73.6

b. Aggressive Behaviour

	Total	Mean
Ingroup	63	10.5
Outgroup	120	20

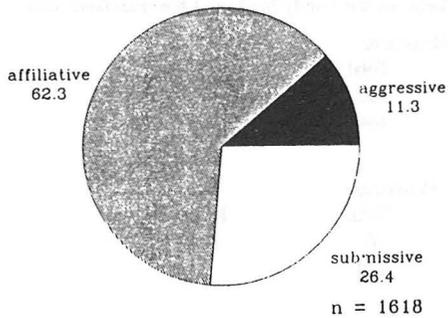
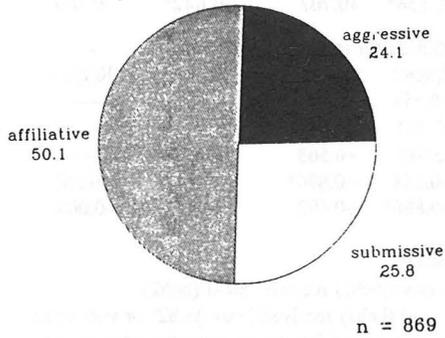
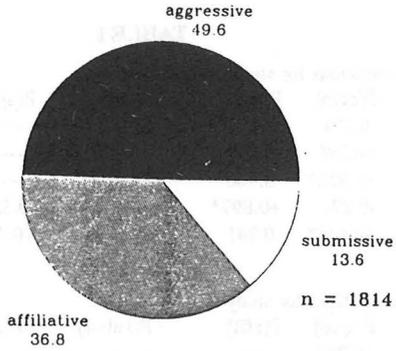
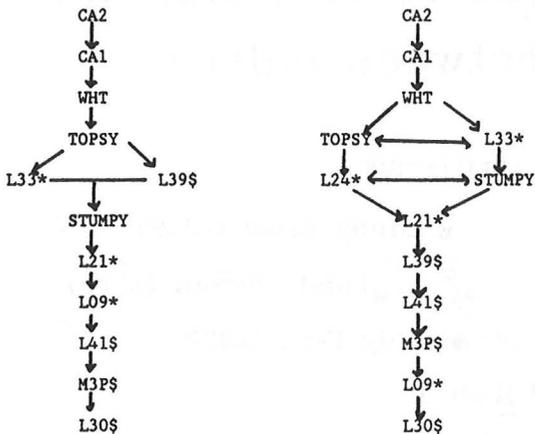


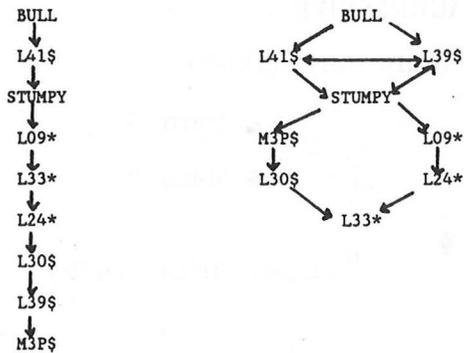
Fig. 2. Total Social Interaction. From the top: Cows 1991, Cows 1992 and Calves 1993. Figures are percentages.

a. Study 1. Performing and Receiving Affiliation: cows 1991



(Pearson's correlation = 0.897)

b. Study 1. Performing and Receiving Affiliation: cows 1992

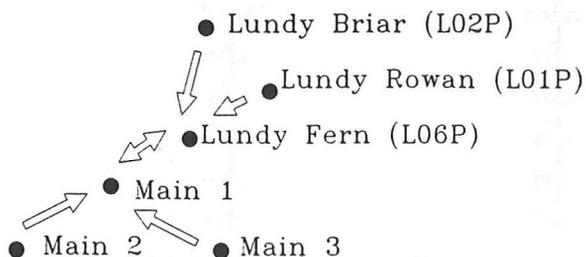


Note. * - Clampit; \$ - Burwood

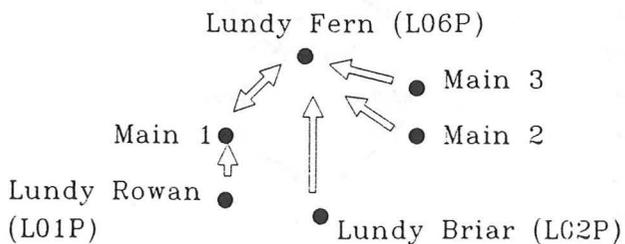
Fig. 3.

Social Attachment between calves

1. AFFILIATIVE



2. AGGRESSIVE



note - these orders are not clearly related

Fig. 4

Individual Differences total social involvement

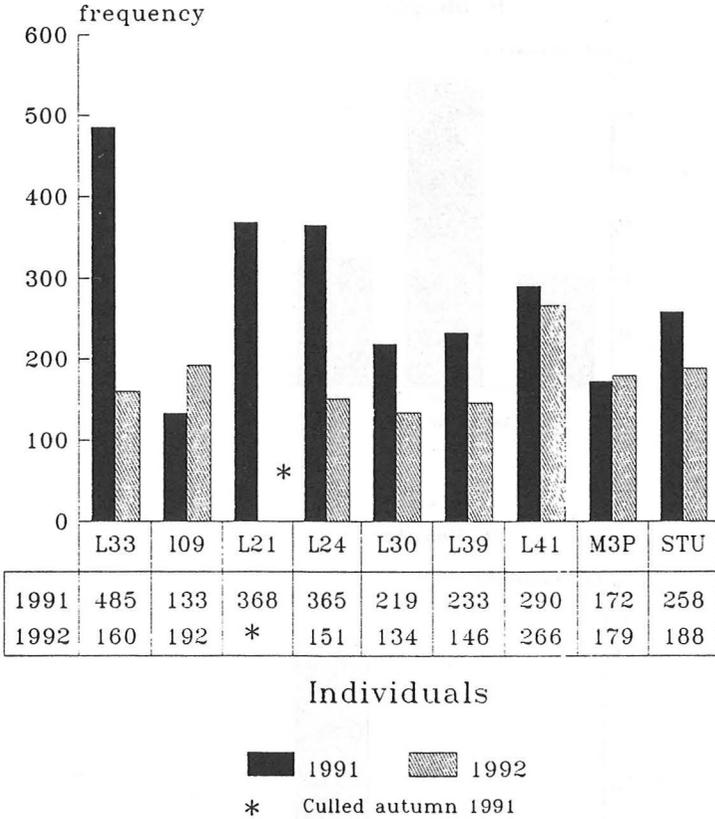
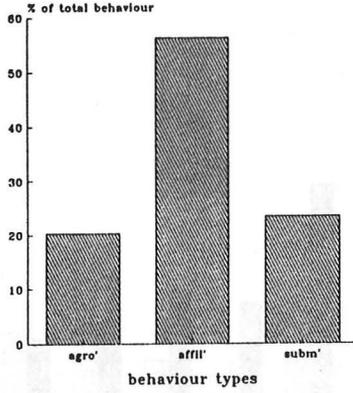


Fig. 5

Personality profiles

B. Dimple



B. Beauty

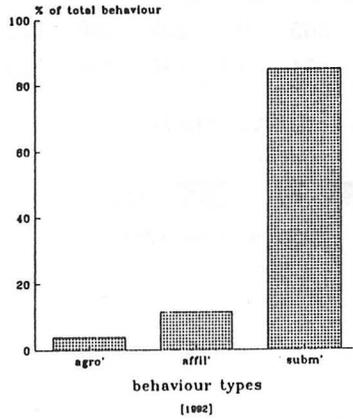


Fig. 6.

1b) and second, between age groups (1a, b & c), supports the proposal that behavioural hierarchies, based on aggression, are not the be all and end all of bovine social behaviour.

A degree of sub-grouping in the adults, according to origin, is evident in the affiliative hierarchies shown in Fig. 3. Consideration of all of the behavioural hierarchies (aggressive and submissive not shown) suggest that in Study 1 cows of Clampit origin were more aggressive, whereas Burwoods were more affiliative. This differentiation persisted from 1991 to 1992, and further supports the argument that there is more to social behaviour than aggression. The group of six calves showed similar sub-grouping according to origin. On the whole calves are more affiliative and less aggressive to calves of the same origin as themselves.

Taking this further, Fig. 4 illustrates the additional specific/individual social attachment between individuals. This demonstrates the complexity of the social relations within a group of just six individuals.

Finally 'total social involvement' was taken as an index of individual differences. This was the total number of interactions that EACH INDIVIDUAL was involved in (Fig. 5). The finding that these are similar, therefore consistent, from 1991 to 1992 (significantly correlated that is), means that this index is a true reflection of differences between individuals. From Fig. 5 it is evident that after Burwood Firze, the Clampits L33, L24 and L09, and Stumpy are the most involved, followed by the Burwoods M3P, L39 and L30. Fig. 6 shows the percentages of performing aggressive, affiliative and submissive behaviours for B. Dimple and B. Beauty in 1992. From this it can be seen that Dimple could be characterised as being 'affiliative' and Beauty as 'submissive' - neither of which are 'aggressive'!

To conclude then, it has been the aim of this paper to challenge the traditional concept of 'dominance orders' and 'social hierarchies'. The lack of distinct orders casts doubt on the validity of 'aggressively determined dominance orders' (see also Reinhardt 1979). The relative importance of affiliative behaviour has been emphasised, indeed as Hinde and Groebel (1992, 3) point out, at a superficial level of observation aggressive acts are more obvious and therefore noticed more readily.

A few alternatives (individual differences - Fig 5 and personality profiles - Fig. 6) have been explored with the intention of furthering the understanding of the social organisation of the Lundy North Devons. Further studies looking at specific behaviours and assessing personalities could be very revealing in demonstrating the complex interplay of the various factors.

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APPENDIX 1. Subject details

STUDY 1: COWS 1991

Eartag	Name	Age	Breed
BJL09	Clampit Nun 90th	3 yrs	N Devon
BJL21	Clampit Nun 93rd	3 yrs	N Devon
BJL24	Clampit Snowdrop 82nd	3 yrs	N Devon
BJL33	Clampit Snowdrop 84th	3 yrs	N Devon
8XL30	Burwood Dimple 93rd	3 yrs	N Devon
8XL39	Burwood Showgirl 6th	3 yrs	N Devon
8XL41	Burwood Firze 3rd	3 yrs	N Devon
8XM3P	Burwood Beauty 15th	3 yrs	N Devon
53958	Stumpy	8 yrs	N Devon cross
???	Topsy	5 yrs	N Devon cross
???	Stumpy's bull calf	5 mnth	N Devon cross
???	Topsy's heifer calf	5 mnth	N Devon cross
WHT	Big Guy (STEER)	18 mnth	Charollais

STUDY 2: COWS 1992

Eartag	Name	Age	Breed
BJL09	Clampit Nun 90th	4 yrs	N Devon
BJL21	Clampit Nun 93rd	4 yrs	N Devon
BJL33	Clampit Snowdrop 84th	4 yrs	N Devon
8XL30	Burwood Dimple 93rd	4 yrs	N Devon
8XL39	Burwood Showgirl 6th	4 yrs	N Devon
8XL41	Burwood Firze 3rd	4 yrs	N Devon
8XM3P	Burwood Beauty 15th	4 yrs	N Devon
53958	Stumpy	9 yrs	N Devon cross
8XM25P	Burwood Dictator 3rd (BULL)	4 yrs	N Devon

STUDY 3: CALVES 1992 (born 1991)

Eartag	Name	Age	Breed	Dam
BIN01P	Lundy Rowan	13 mnths	N Devon	L09:C Nun 90th
BIN02P	Lundy Briar	13 mnths	N Devon	L30:B Dimple 93rd
BIN06P	Lundy Fern	13 mnths	N Devon	M3P:B Beauty 15th
???	(mainland)	7-9 mnths	N Devon	????
???	(mainland)	7-9 mnths	N Devon	????
???	(mainland)	7-9 mnths	N Devon	????

APPENDIX 2. Grouping of Social Behaviours Used.

1. AGGRESSIVE/THREATENING:

(primary)

PB	Push body
PH	Push head
PN	Push neck
BB	Butt body
BH	Butt head
BN	Butt neck
TH	Turn (opponent's) head

(secondary)

HC	Head lower (chin in)
HW	Head throw
HT	Head toss
HS	Head shake

2. SUBMISSIVE/WITHDRAWAL:

EW	Withdrawal of the ears
HA	Turn head away
BO	Back off
WW	Walk away
LA	Leap away
TW	Withdrawal of the tail

3. AFFILIATIVE:

(primary)

HX	Head extend
TC	Touch
NU	Nudge/nuzzle
SF	Sniff body
NH	Sniff head
NN	Sniff nose
LI	Lick body
LH	Lick Head
RB	Rub body
RN	Rub neck
RH	Rub head

(secondary)

HL	Head lower (semi-extended), chin out
HR	Head rest
TO	Turn head towards
TT	Turn body towards
AP	Approach
CM	Make physical contact with
CW	Contact walk
FO	Follow

4. CONTACTBREAKING: (non-aggressive)

CB	Contact breaking
OO	Ignoring (i.e. no immediately observable response)

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