# The development of rank order and aggressiveness in a group of juvenile Greylag Geese

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## Introduction

The 'triumph ceremony' appears in all species of true geese (Heinroth, 1910; Lorenz, 1935, 1963; Klopman, 1961; Fischer, 1965; Fabricius & Radesäter, 1971).

The triumph ceremony in its most typical form is schematically presented in Figure 1 from Fischer (1965). Numbers 1–4 show the first part of the ceremony—*Rollen*—in which the male of the pair attacks a real or an imagined enemy. When the attack is over, he returns to the female loudly trumpeting with his neck upwards. Numbers 5–6 show the second part of the triumph ceremony—*Schnattern* is the 'greeting'. Here the birds meet each other with a cackling sound and with low protruding necks which are directed past each other. This part of the ceremony has an ontogenetic precedent in the youngster's vi-sound with neck protruding, while *Rollen* appears in adulthood without any earlier stage in its ontogeny (Fischer, 1965). According to Lorenz (1963) the cackling ceremony functions as a bond to keep individuals who know each other together.

Heinroth (1910) found no social hierarchy nor disagreement within a goose family. Similarly, Lorenz (1935) wrote: 'a rankless tolerance is kept until the late autumn. Then at first the unity of the family group disappears and is replaced with a hierarchy'. Fischer (1965) and Lorenz (1963) think that there is no aggression and therefore no pecking order between goslings in such a group in the Greylag Goose *Anser anser*. In contrast, Fabricius & Radesäter (1971) and H-B. Rodemar and R. Larsson (unpublished) have observed lively fights, with an obvious hierarchy, between brothers and sisters of the Canada Goose *Branta canadensis*. Collias & Jahn (1959) have also observed fights between goslings of the Canada Goose. Fabricius & Radesäter (1971) and B. Wasstorp (unpublished) have even seen aggressiveness with a hierarchical arrangement in the Greylag.

The main endeavour of the present work is to see whether or not there exists a rank order between the goslings in a family group of Greylag goslings, and to investigate the relationship of aggression to rank order.

## Materials and methods

This investigation was made at the Zoo-

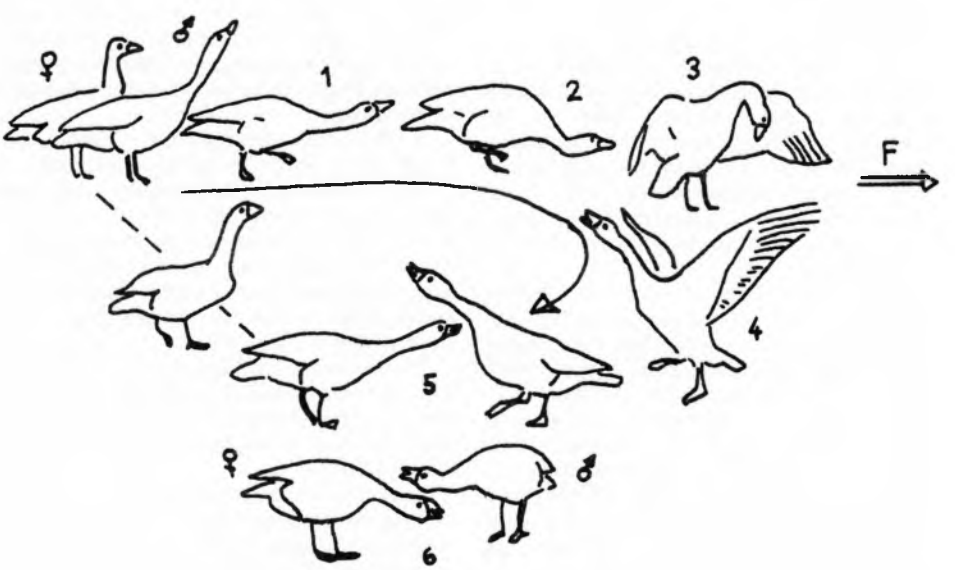


**Figure 1.** The triumph ceremony of the Greylag Goose schematically illustrated (from Fischer, 1965).

logical field station Öster-Malma, 100 km south of Stockholm, 5 May–26 June 1972.

The group consisted of five Greylag Geese from eggs taken from nests belonging to a wild breeding population in Kalmarsund on the south-east coast of Sweden. The eggs were hatched in an incubator, and the goslings marked with coloured plastic leg rings.

The time for the hatching varied between the daytime of 7 May and the night time of 9 May. Observations began on the 4th day, i.e. 12 May.

White-Blue died on the 4th day and was replaced by a new gosling hatched the night of 8 May.

After the hatching the goslings were moved to another, drying, incubator. They were taken from this machine at age 20–24 hours for 'imprinting' to me as their foster-mother. They were placed at my feet one by one. I moved forward, with a constant repetition of the sounds 'come-come-come'. This procedure was repeated once or twice and then the imprinting was done twice again with the whole group together.

For 9 days the geese were kept in a box furnished with a warming lamp. Then they were moved to a room with a water basin and connected with a fenced area outside. They were fed with growth pellets, given in a crushed form for the first week. They were able to graze all kinds of herbs and grasses during the day. Some vitamins were added to the drinking water.

All types of activity of the goslings were noted along with the time of every movement during 4–6 hours each day. The observations were made out of doors except on a few occasions when the weather was too bad.

This study primarily investigated behaviour showing aggression, inferiority and dominance. Aggressiveness refers to behaviour with definite pecks against an antagonist. Inferiority was indicated by a 'facing-away', and dominance by the lack of this movement. The activities were filmed with a super 8 cine camera, and a motor-driven slide-camera.

Most of the material deals with spontaneous activity. A very small part arises from experiments in which two siblings were placed about 10 m from each other. Usually they then run towards each other and their reactions in respect to each other, and towards the others in the group were observed. These artificial confrontations were done every day from the time that the goslings were between the ages of 7 and 14 days. After that they seemed so accustomed to the situation that they no longer reacted to each other.

**Results and discussion**

Some of the important developments in the ontogenesis of the Greylag Geese are given below.

First day: any form of disturbance in the environment elicited a characteristic greeting-call 'vi-vi-vi'. The sound was high intensity followed by a neck-protruding. This greeting was very seldom directed towards the stimulus. Just before they fell asleep, they made a high soft buzzing sound. A contact call, elicited during imprinting, was distinguished from the greeting call by having a higher degree of continuity and slightly shorter syllables. Its function seemed to be to keep the group together. If any of the goslings moved away from the group, he uttered a shrill screaming peep of abandonment. During such a scream the lonely gosling ran about until he found his brothers and sisters, whereupon the greeting calls were followed by contact calls.

Second day: greetings were directed towards the stimulus, usually another gosling, which usually answered the greeting. The goslings bit each other's bills and pecked eyes and claws. These seem not to be aggressive acts but more resulting from curiosity and interest in contrasting, obvious objects.

Third day: the first aggressive behaviour was observed. When real bites were given between the goslings, a facing away or a flight from the place of contact resulted.

Fourth day: greetings with evident facings away appeared.

Fifth day: 'buffing' and pushing movements were made in the group when they were going to sleep. This behaviour probably represents the attempts of normally raised goslings to get under the warming plumage of the mother.

Seventh day: the goslings raised their heads and looked around when alarmed.

The frequency of the sleeping calls was much higher during the first week. This is probably partly due to the temperature being lower then and so they huddled together to keep warm and went to sleep. The primary cause could be that they needed much rest in their first week of life.

The threshold releasing the abandonment peep became remarkably higher as the birds became older, paralleling the successive disappearance of the imprinting both to me and to the siblings.

Greetings of the goslings directed towards me (the mother) were both the most common and the most intense. Often, brief 'greeting-orgies' broke out when something alarming happened to the goslings. This happened, for

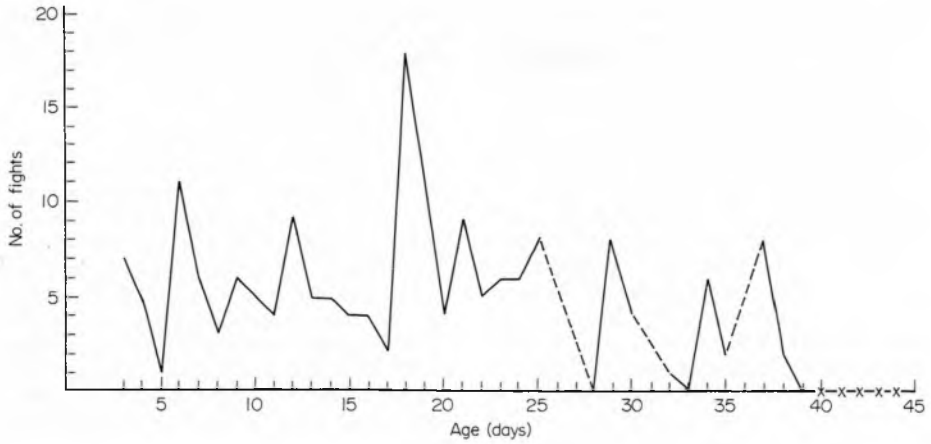


**Figure 2.** The number of fights during 4 hours per day.

example, when I had been away just for a few minutes and then returned to the goslings.

During the third day of life actual aggressive fights appeared. Stress seemed to be a factor that promoted irritation and aggression. In addition, the fights were released in connection with greetings. The fights appeared nearly as often just before a greeting as after a greeting. A fight finished either when the subordinate bird was forced to turn its head away because of bites from the dominant bird, or when it escaped. The number of fights is shown in Figure 2. The peak when they were 18 days old was due to unusually stressed circumstances, involving exposure to many unknown people. Otherwise the number of fights was distributed rather equally throughout the observation period. It is remarkable that for these Greylag Geese fights went on until the 38th day of life. In the Canada Goose fights occurred only until about the age of 20 days (Fabricius & Radesäter, 1971) and according to Radesäter (personal communication) it should be the same even for the Greylag Goose. Fischer (1965) has, during 10 years' studies on the Greylag Goose, only noticed fights between siblings on five occasions. An important difference is that Fischer's Greylag Geese were living in normal goose families, whereas mine have been imprinted on a human. It seems very likely that a real goose mother, just by her presence, obstructs the aggression of her goslings. A human foster-mother probably does not have such a great influence on the goslings as she cannot be with them permanently. It would have been desirable to have had a natural group as a control to an imprinted one.

Rank order may be established later among my Greylag Geese than among the Canada Geese, but the later fights may have had nothing to do with the rank order but were dependent upon stress factors. Figure 3 shows that after 15 days the geese obviously have composed a rank order, for in nearly 100% of aggressions a facing away by the subordinate bird was elicited, thereby ending the fights.

The facings away, with learning and individual recognition, changed from just a protective measure to an appeasement signal. According to T. Radesäter (personal communication), goslings always turn their heads

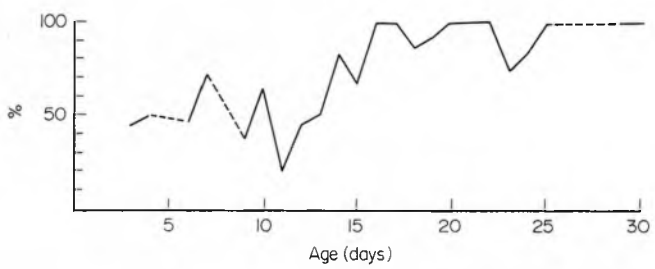


**Figure 3.** The development of facing away during fights. The ordinate axis shows the percentage of the total number of aggressions where one can immediately observe dominance and subordinance.

away in exactly the same manner, indicating a genetically determined basis. It is possible that both learned and innate movements are involved in the development of a facing away.

A similar turning away of the head described in Canada Geese (Klopman, 1961; Fabricius & Radesäter, 1971). Lorenz (1963) and Fischer (1965) described another form of appeasement signal in Greylag Geese, called redirection, thought to be completely innate and appearing between the 20th–60th day of age. This has also been confirmed by isolation experiments made by B. Wasstorp (unpublished). Both Fischer and Lorenz described and explained the redirection in the following way: the aggressiveness of the goslings increases perceptibly towards strange geese between 20–60 days (paralleling the development of the contour feathers). Since the neck posture in threat and greeting ceremonies is practically identical, these two expressions can easily be confused among the siblings. It is during such 'misunderstandings' (seldom observed by Lorenz) that aggressions in a group can appear. A bite caused no counterblow but rather an eager greeting ceremony. The attacked bird did not then direct its neck straight against the partner, but laterally away from it. This caused the attacker to act in the same way, ending aggression. The re-directed movement, together with deeper vi-sounds (due to the breaking of the voice), Fischer (1965) called *Schnattern.*

It is odd that both Fischer and Lorenz so seldom observed fights in a group of siblings, since both their descriptions of the genesis of the redirection start with fights. It may be that our definitions, which are necessarily subjective, are not the same.

Lorenz (1963) is of the opinion that the greeting (*Schnattern*) has developed from threat behaviour by redirection and ritualization. The early neck-protruding with the following vi-vi-vi-sound is the preliminary stage to both the threat behaviour and the second part of the triumph ceremony. Lorenz says also that it is only during a short period in the ontogeny when the inhibiting functions of the redirection are clear. In a fully developed triumph ceremony there is no aggression and it is activated by an independent drive.

If there is demonstrably a completely innate signal, the function and the meaning of the early fights with the facing away and the resulting rank order may be questioned. Neither Heinroth (1910), Lorenz (1935) nor Fischer (1965) have seen any rank order between the siblings in a brood.

However, there is no reason to doubt the existence of the rank order between the members of my brood, at least until the time for the appearance of the redirection movement. The value of the rank order, as a factor that prevents and diverts outbursts of aggression, is obvious. In my geese the redirection movement was developed gradually, not suddenly. Even when it had appeared, facing away and the rank order was still noticeable,

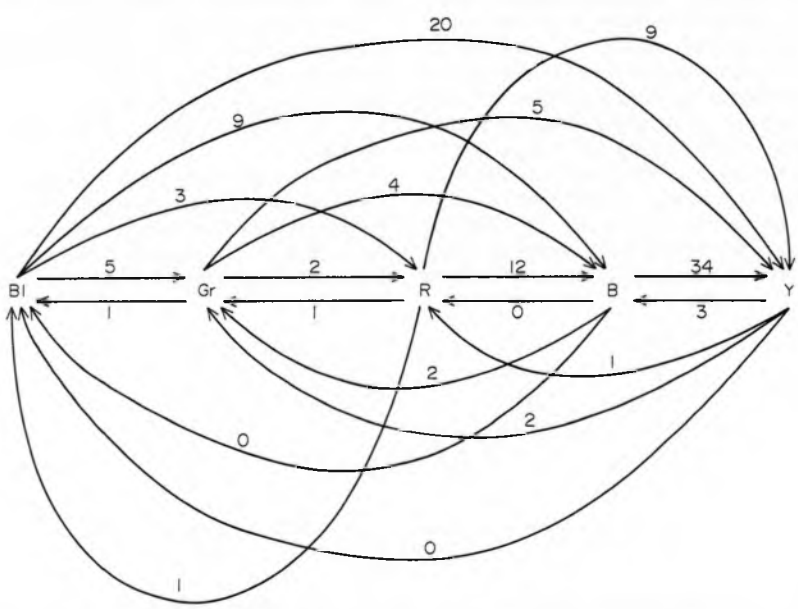


**Figure 4.** Rank order during fights of five Greylags (Black, Green, Red, Blue, Yellow).

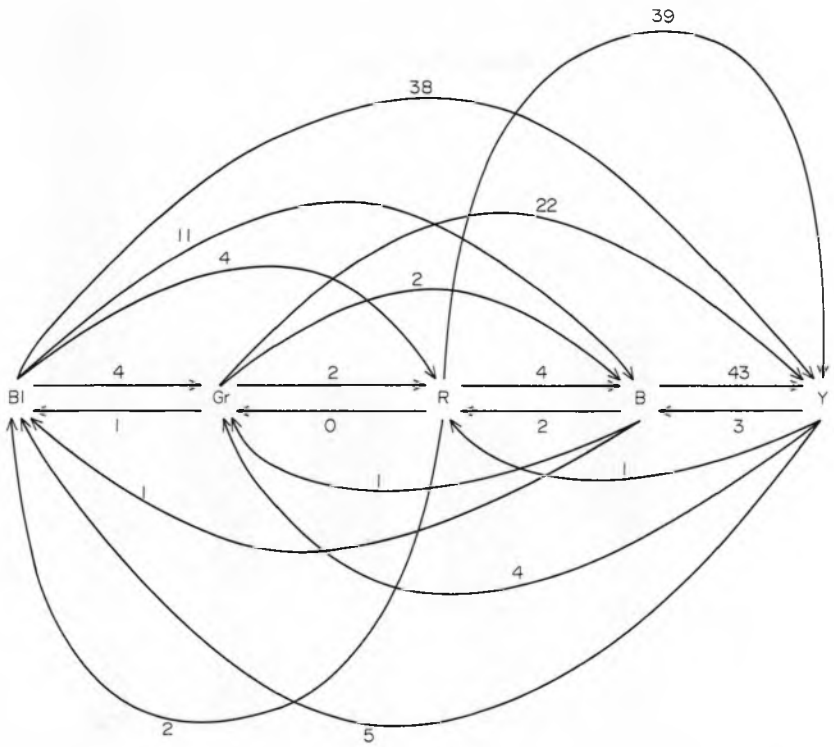


**Figure 5.** Rank order during greetings of five Greylags (Black, Green, Red, Blue, Yellow).

but slowly diminished. It seems likely that the fights, due to learning, hastened the development of the redirection. Facing away also began already on the 4th day to appear in the greeting ceremonies.

The dominance in fights and in greeting ceremonies resulted in a clear linear rank order: Black-Green-Red-Blue-Yellow, as illustrated in Figures 4 and 5. These are based on all data for the 4th–30th day. Various shorter periods were investigated to attempt to follow the establishment of the rank order, but the data were then too few to allow any definite conclusions to be drawn.

The rank order was demonstrable only in connection with fights and greeting ceremonies. It had no place in feeding, even when the opening to the food container was made so small that only one bird at a time could insert its beak. Nor was there correlation with the rank order when following the foster-mother, the sequence changing all the time. There appeared to be no correlation between the weight of the goslings, at any time, with their place in the hierarchy. The sex of the individuals was not determined.

T. Radesäter (unpublished) found that the gosling of the highest rank received the most greetings and delivered the fewest, while the one of the lowest rank received the fewest and delivered the most. From Figure 6 it is clear that this inverse relationship did not hold in my group. However, Yellow, the lowest ranking bird, ran nervously among its siblings and created, in this way, more opportunities for greeting, leading to an overall higher total.

Greetings can be (1) mutual, (a) with, or (b) without a facing away, or (2) non-mutual. About 50% of the greetings were of type 1(b), 30% were of type 1(a) and the remainder of type 2. The total number of greetings was 628. That as many as half the greetings were of type 1(b), is probably due to the fact that the redirection movement developed at an age of about 25 days.

The second type of greeting appeared to have some connection with the rank order in that the bird in the lowest rank most often performed the greeting while the one of highest rank was the one that did not answer (Figure 7).

A third type of greeting was directed out into the air and not towards any individual. It had the highest frequency during the earliest period of the goose's life and was entirely eliminated at an age of about 25 days and replaced by greetings to the stimulus.

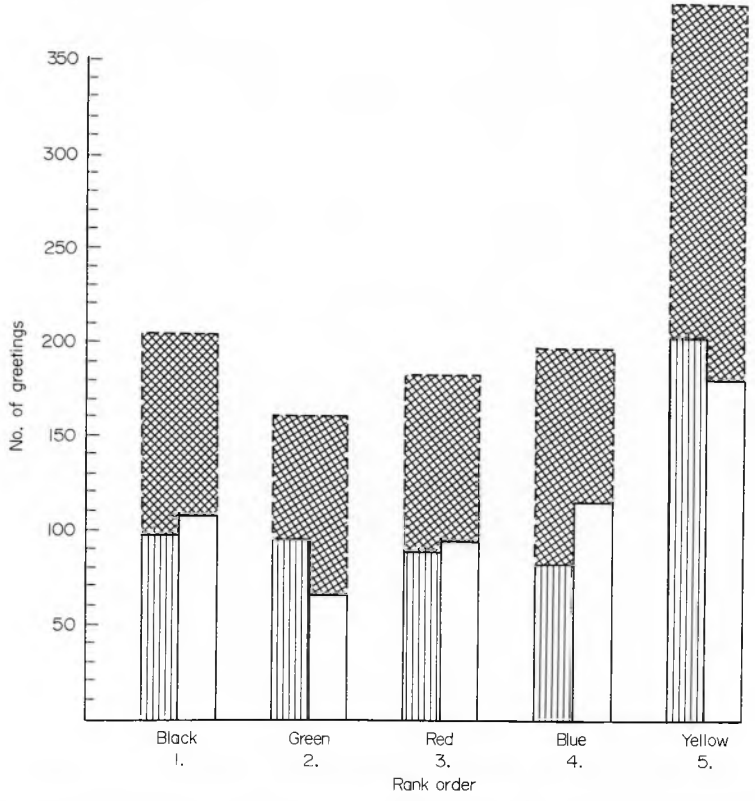


**Figure 6.** The relationship between received and delivered greetings and the rank order. Age; 4–30 days. Hatched columns, delivered greetings; open columns, received greetings; cross-hatched columns, the total number of greetings/individual.

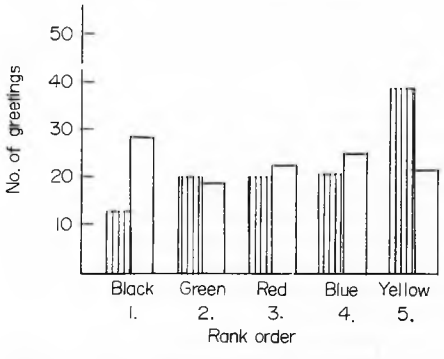


**Figure 7.** The relationship between the number of non-mutual greetings and the rank orders. Hatched columns, delivered greetings; open columns, received and not returned greetings.

Greetings were elicited by some form of disturbance or uneasiness in the group, as when one gosling was some distance from the rest. At the reunion, an eager greeting ceremony appeared that had the impression of welcoming and of giving assurance that everything was in order again.

**Summary**

In a group of five incubator-hatched goslings, which were human-imprinted, fights were fairly common and a linear rank order was established. Greeting, appeasement and redirected behaviours are described. Different results obtained in other studies are discussed.

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An Egyptian Goose *Alopochen aegyptiacus* with its goslings. *E. E. Jackson*