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Abstract: Subdivision of a population into reproductive units and rates of exchange among them may influence population dynamics. Unfortunately, subpopulation units and flows of immigration and emigration are difficult to estimate because of the lack of data on spatial behavior of individuals. By studying two populations of chamois (Rupicapra), 244 marked animals, and a 10-year monitoring program, we determined that subpopulation units were related closely to topographic limits in which >90% of the females were philopatric. Males had a greater tendency to disperse than females, especially before reproduction, but females did more exploratory movements. We found no difference in sex-specific dispersal rates between sites, despite differences in densities and sex-ratio. The relatively high dispersal rate of males and the lack of effects of sex-ratio and density on dispersal rates support the inbreeding-avoidance hypothesis as a main cause of dispersal. High rates of exploratory movements, especially among females, indicates that local recourse competition within female groups also may play a role. Dispersal patterns have to be explained in the context of possible different motivations between sexes, related to social and spatial segregation. Moreover, we argue for an effect of topography, which determines where dispersal is possible. Accordingly, dispersal occurred at a site with continuous connections with favorable habitat. Colonization of new areas from protected reserves is limited by low dispersal rates of females and increasing isolation between favorable areas in mountains. Management and conservation policies have to take these aspects into account to predict distribution of chamois on a large scale and cope with high local densities resulting from female philopatry.
SUBPOPULATION STRUCTURE AND DISPERAL IN TWO POPULATIONS OF CHAMOIS

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LOËT AG ET AL.-DISPERAL OF CHAMOIS

Table 1. - Predications about age differences. Appen disperal effort of density is also expected from the three main hypotheses of dispersal behavior. These predictions are valid for chamois, which is a demicahic species with a polygynous mating system, a small maternal home range, and a seasonal variation in space use and social organization. The adult sex ratio and the density of the population (in the study years 1984 to 1988) are expected to disperse, and a decrease in density is the opposite. Naive dispersal is defined as dispersal occurring before breeding; first dispersal occurs after the individual has bred.

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<tr>
<th>Hypodensity</th>
<th>Age difference</th>
<th>Appen</th>
<th>Density effort</th>
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<tr>
<td>Resident</td>
<td>Age &lt; 3 years</td>
<td>High + breeding</td>
<td>Dispersal in males in in situ</td>
</tr>
<tr>
<td>Main dispersal</td>
<td>Age &gt; 3 years</td>
<td>High + breeding</td>
<td>Dispersal in males in in situ</td>
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- recruitment in females (Moreau and Salleron, 1990) and survival and growth of offspring (Oboure and Yves, 1992).

Population dynamics can depend on rates of immigration and emigration (Rogel et al., 1996); but also on local rates of emigration and colonization (Schaub et al., 1999). Few studies have been done on spatial patterns to re-

State variables included in the model were sex and age of individuals, density of the population, seasonal and daily

Key words: Bacopa maritima, P. pseudomusci, chamois, spatial structure, philopatry, dispersal, subpopulation units, stability, France

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Materials and Methods

Both the sites were selected in the northern ocean, approximately 50 miles from the beach. The water was separated by two large basins, and each basin was divided by a series of rocky outcrops. The basins were approximately 50 miles wide and 10 miles long. The water temperature was 72°F (22°C) with a salinity of 35‰. The water was clear, with a visibility of over 50 feet (15 meters). The bottom was covered with a mix of sand, mud, and small rocks. The water was calm, with a gentle current.

The study aimed to investigate the effects of environmental factors on the population and behavior of the species. The data was collected over a period of two years, from May 2018 to May 2020. The data was analyzed using statistical software, and the results were presented in a series of graphs and tables.

The results showed that the population of the species increased significantly during the study period. The population size doubled from May 2018 to May 2019, and then increased by 50% in May 2020. The growth rate was highest during the summer months, with a peak in July. The species showed a strong preference for shallow waters and warm temperatures.

The study also investigated the behavior of the species. The species was found to be highly social, with large groups swimming together. The species was also found to be diurnal, with activity predominantly during the day. The species was found to be migratory, with individuals moving between the two basins during the study period.

In conclusion, the study showed that the species is highly adaptable and responds well to environmental changes. The results are significant for the management and conservation of the species. Further research is needed to understand the long-term effects of environmental changes on the species.

References

year, but was more intense from May to September, a period in which at least one grown was in the field every day, weather permitting. We used monocotyledons (22-50 cm) in broad-leafed, and in wet, medium, and high. The effect of age on dispersal rate in other studies are not indicated in terms of low, medium, and high. The effect of age on dispersal rate in other studies is noted by age class (30-90 cm) in broad-leafed, and in wet, medium, and high. The effect of age on dispersal rate in other studies is noted by age class and sex (male or female). A species can be classified as a "dispersal" or a "dispersal" species if its movement is greater than in the original zone, after short-range or long-range movements. Similarly, a species can be classified as a "dispersal" species if its movement is greater than in the original zone, after short-range or long-range movements. 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short-range or long-range movements ($g = \frac{2.3}{s^2}$). The difference between males and females was not significant. Marked individuals, 32% were never seen outside their original zone, 34% were seen at least once in a neighboring zone, and 34% in a non-neighboring zone. Among the 31 males (out of 36) that made short-range movements, 10 were killed and 11 were not. None of these 11 non-killed males (6.6%) never returned to their original zone. We therefore estimated that 63.6% of the 19 marked males that performed short-range movements would have dispersed (i.e., 6.6 males). Among the seven males off the island that performed long-range movements, nine were not killed. Among these, three returned to their zone of marking, which led us to estimate that 75% of the males that left the island were observed to disperse. We estimated that 22% of the remaining males that were marked but not killed would have dispersed (i.e., 6.6 males). The difference between sexes for the proportion that left the island was not significant. However, the proportion that left the island was significantly higher for females ($\chi^2 = 4.642, df = 1, P = 0.036$). Among the 11 males that were killed, none of the females that dispersed. A close correlation was observed between individuals that dispersed and those that did not. The barrier of the valley apparently disrupted the two zones, although it represented no real barrier to movement of channels.

Dispersal occurred after the age of first reproduction for one male and two females in Ota (Table 3). We did not test that all females using a $g = \frac{2.3}{s^2}$ because of the small sample size of dispersing females ($n = 4$) and for one of the 15 males (Table 3). Mean linear distance traveled by dispersal, however, was not significant for individuals performing long-range movements. We included the three rangers and two females that were killed after long-range movements to those samples. Percentage of individuals performing short-range movements was not significant between males and females (i.e., $g = 2.3, df = 1, P = 0.063$). Mean linear distance traveled by dispersing individuals was 5.8 km (median = 0.1 km, range = 3.5-10 km) for females and 5.5 km (0.1 km, 3.6-17 km) for males. The largest distance (17 km) was traveled by a 1-year-old male.

The effect of sex was also significant for dispersal. Phosphates (Table 3), $\chi^2 = 15.22, df = 1, P = 0.000$. Males dispersed more often than females (53.3% versus 48.8%, respectively). In Ota, we recorded no instance of an individual returning to its original zone after a long-range movement, but all individuals performing short-range movements did. This simplified our calculation of the dispersal rate, because the number of dispersers was equal to the number of individuals performing long-range movements. In all the sites, 92.5% of the females were phosphates. A close relationship also existed between topographical features and phosphates. The zone of the valley apparently disrupted the two zones, although it represented no real barrier to movement of channels.

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