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Two species competition model

Competition occurs indirectly when two or more organistic units use the same resources and when these resources are in a short offer. This process involving depression or resource exhaustion has been labeled competition or exploitation. The competition can also occur through more direct interactions as in the interspecific territoriality or in the production of toxins, in which case it is defined interference competition. The competition for the space, as in the rocky intertidal, often mediated by those who arrive before, preventive competition was defined. The interaction between the two organisms units reduces the density of the fitness or balance population or both of each unit. This can occur in different ways. Requesting that an organismic unit extends part of its time, matter or energy on competition or the avoidance of competition, a competitor can effectively reduce the amounts left for maintenance and reproduction. Using or occupying part of a scarce resource, competitors directly reduce the amount available to other organic units. The mechanisms of interference competition, such as interspocific territoriality, will be favored by natural selection only when there is a potential for overlapping in the use of limited resources at the beginning (ie, when the exploitation competition is potentially possible). The intraspecific competition, considered in chapter 9, is the competition between individuals belonging to the same species, usually at the same population. Interspecific competition takes place between individuals belonging to different species and is of general interest in this chapter. Because of its symmetry, it is always advantageous, when possible, for both sides in a competitive relationship it avoids interaction: the competition was therefore an important evolutionary force that led to the separation, specialization and diversification of the niche. If, however, the avoidance of a competitive interaction is impossible, natural selection can sometimes favor convergence. Competition is not an ON / OFF process; Rather, its level presumably varies continuously as the report report on changes to supply. Therefore, there is little, if present, competition in an ecological vacuum cleaner, while competition is acute in a completely saturated environment. There are all grades of intermediates. Competition was placed on one, albeit very simplistic, enough theoretical bases almost a century ago by Lotka (1925) and Volterra (1926, 1931). Their equations that describe competition have strongly influenced the development of modern ecological theory and illustrating a mathematical model of an important ecological phenomenon. They also help develop a series of very useful concepts, such as competition coefficients, the Community matrix and widespread competition, which are conceptually independent of equations. The equations of the Lotka-Volterra competition are a modification of the verhulst-pearl logistics equation and share its hypotheses (chapter 9). Consider two competing species, N1 and N2, with transport capacity K1 and K2 in absence of each other. Each species also has its maximum instantaneous speed of increase per head, R1 and R2. The simultaneous growth of the two competing species that occur together is described by a pair of differential logistics equations: DN1 / DT = R1N1 ({K1 - N1 - Î ± 12 N2} / K1) (1) DN2 / DT = R2N2 ({K2 - N2 - Î ± 21 N1} / K2) (2) where Î ± 12 and Î ± 21 are competitive coefficients; Ãž ± 12 is a characteristic of species 2 which measures its competitive inhibition (per individual) on the population of species 1; and Î ± Î Î ± 21 is a similar feature of the species 1 that measures its per capita inhibitory effects on species 2. Competition coefficients are provided To show which population is interested and has the effect; Therefore, Î ± 12 measures the inhibitory effect of an individual N2 on the growth of the N1 population, while Î ± 21 represents the effect of an individual N1 on the N2 population. In the absence of any any Competition [Ãž ± 12 or N2 is equal to zero in the equation (1); Ãž ± 21 or N1 equal to zero in the equation (2)], both populations grow sigmoidally according to the verhulst-pearl logistics equation and reach a density of a balanced population to their load capacity. By definition, the inhibitory effect of each individual in the N1 population on the own growth of the population is 1 / k1 (see also chapter 9); Similarly, the inhibition of each single N2 on the N2 population is 1 / k2. Similarly, from the control of (1) and (2), the inhibitory effect of each single N2 on the population N1 is Ãž ± 12 / k1 and the inhibitory effect of each individual N1 to the N2 population is Ãž Â ± 21 / K2. Competition coefficients are normally, but not always (see subsequent discussion), numbers less than 1. The result of the competition depends on the relative values of K1, K2, Ãž ± 12, and Ãž ± 21. Four possible cases of interaction Competitive correspond to different combinations of inequality values for these constants (Table 12.1). Table 12.1 Summary of the four possible cases of competition under the Lotka-Volterra Competition equations ____ species 1 can contain species 1 cannot contain species 2 (k2 Â Â Â Â Â Â Â ± 21> K1) species 2 (k2 Â Â ± 21> k1) ____ species 2 can case 3: both species case 2: species 2 contain species 1 may win always wins (K1 / Î ≤ ± 12 k2) stable cohabitation ____ To see this, we ask what density of individuals N1 is the N2 population held exactly at zero, and vice versa? In other words, what the density of every species will always prevent the other to increase? Using note inspections that at a n2 of k1 / Ãž Â ± 12, n1 cannot increase and that when n1 reaches k2 / Ãž â ± 21, n2 can never increase. In the absence of other species, species populations increase in any density of their own load capacity and decrease for any value above it. As previously developed, in the presence of K1 / Ãž ± 12 individuals of the N2 population, N1 decreases in all densities; And in the presence of K2 / Ãž Â ± 21 individuals in the population N1, N2 decreases at every density. We remind you that, under the verhulst-pearl logistics equation, RA diminishes linearly to increasing N, reaching a value of zero DensitÂ K (Figure 9.2). Exactly the same relationships are valid for the equations of Lotka-Volterra Competition, only that here a family of straight lines refer to the R1 and R2 K1 to K2; Each line corresponds a different population density of competing species (figures 12.1a and 12.1b). The R axis is omitted in Figure 12.2 and N1 is simply traced with N2. Furthermore, in this level N1-N2 therefore correspond to different proportions of the two species and different population densities of each one. Setting DN1 / DT and DN2 / DT equal to zero in equations (1) and (2), and the solution, gives us equations for contour conditions between increase and decrease for each population: (K1 - N1 - I Â ± 12N2) / K1 = 0 or n1 = k1 - Ãž ± 12N2 (3) (K2 - N2 - Ãž Â ± 21N1) / k2 = 0 or n2 = k2 - Ãž Â ± 21N1 (4) Figure 12.1. Two woes that show how the actual instant rate per capita increment (RA1) varies with the population density (N1) and that of its competitor (N2) under the equations of Lotka-Volterra Competition. (A) Two-dimensional graph with four lines, each of which represents a density date of competitors (compare with figure 9.2). (B) three-dimensional chart with N2 axis showing the On which each of the four lines in (a) lie. A density of N1 and N2 above K1 and K1 / Ãž Â ± 12, respectively, the aircraft continues with RA1 becoming negative [compare with (a)]. Figure 12.2. A plot texture At that of figure 12.1b, but only the N1 N2 plan is shown to RA1 equal to zero. The line represents all the conditions of equilibrium (DN / DT = 0) to which the population N1 just remains (RA1 = 0). In the shaded area under the line, RA1 is positive and the N1 population increases (arrows); Above the ISOCline, RA1 is always negative and the N1 population decreases (arrows). An equivalent texture exactly could be drawn on the same axes for the competitor, N2, except for the wiretapping of the N2 Isocline (DN2 / DT = 0) are K2 and K2 / Î ± 21 and the parallel arrows of the Axis N2 instead of the N1 axis. See also Figure 12.3. These two linear equations are drawn in Figure 12.3, giving ISOCLINE DN / DT for each species; Under these Zero Isoclines populations of each species increase, and above them diminish. Therefore, the lines represent density or saturation values of the balance population; Né the species can increase when the combined densities of the two are above its isocline. The four cases of competitive interaction are summarized in Table 12.1 and shown graphically in figure 12.3. Only a combination of values (Case 4) leads to a stable balance of the two species; This case stands when none of the two species is able to achieve the densities high enough to eliminate the other - when both k1

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