3) Contributions to „Ariantology“: Morphometric and genetic differentiation and dispersal in populations of *Arianta arbustorum* (Helicidae) in the Northern Alps of Austria*

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Introduction

Arianta arbustorum, a highly polymorphic landsnail, is common in north western and central Europe in damp habitats of various types from lowlands up to alpine level (2700m altitude). The shell is usually globular with a closed umbilicus and decreases in size with increasing altitudes. In some mountain stocks in Austria, however, there are populations with a depressed shell and an open umbilicus. Despite their regional occurrence in the northern alps at altitudes above 800m morphometric and anatomical studies reveal that the concept of a clearly definable subspecies has to be rejected. Since we do not assume ecological factors to account for the striking difference in shell morphology we investigate genetic differentiation of Arianta-populations in Austria. Additionally, distribution and vagility of *Arianta arbustorum* in an alpine habitat is analysed. For the present study we focused on populations on a transect in the Gesäuse mountains in Styria. Allele frequencies at 15 enzymatic loci were analysed to provide information on populations structure and genetic differentiation among populations. Parallel to genetic and morphometric studies a 2-year mark-release-recapture experiment in one of these transect populations (individuals with extremely depressed and umbilicated shells) was carried out to study movement patterns and dispersal capacity of adult snails in an alpine habitat. We present the preliminary results of these ongoing studies.

Acknowledgements: ★ KSW: named after Hans Kothbauer, Helmut Sattmann and Erhard Wawra whom we wish to thank for their engagement and their support!

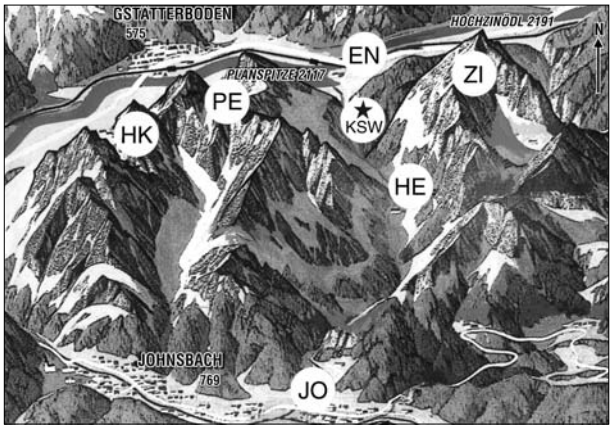

Fig. 1: **Locations** of the populations in the Gesäuse mountains and number (n) of individuals used for morphometric and genetic studies:

JO = Johnsbach, 870m (n=29),
EN = Ennstal, 540m (n=30),
KSW = Wasserfallweg, 860m (n=30),
HK = Haindlkar, 1100m (n=29),
ZI = Zinödlalm, 1550m (n=28),
HE = Hesshütte, 1600m (n=32),
PE = Peternpfad, 1780m (n=33).

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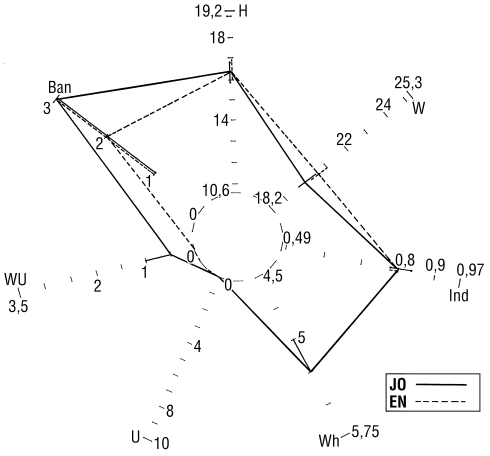
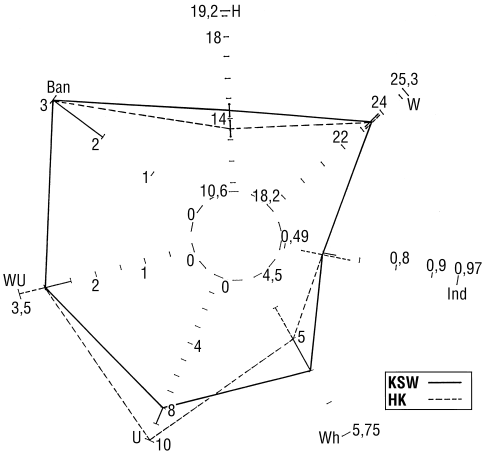
* Poster presented at the Twelfth International Malacological Congress 1995 in Vigo, Spain.





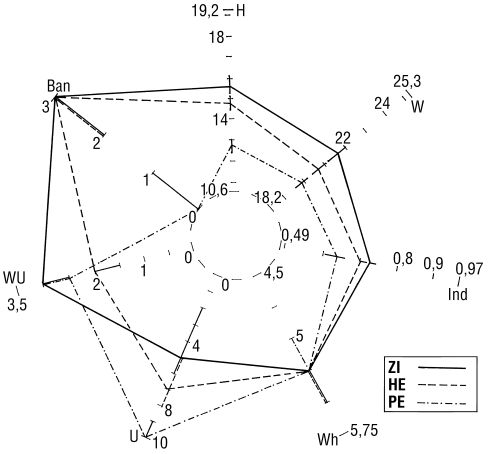


Fig. 2-4: **Morphology:** Shell characters: H = shell height (mm), W = shell width (mm), Ind = H/W-shell shape, Wh = number of whorls, U = degree of umbilication (0 = closed umbilicus, 1 - 10 = 10% - 100% open umbilicus), Wu = width of umbilicus (mm), Ban = banding (0: unbanded, 1 - 3: intensity of the brown band). ($\bar{x}$ for H, B, Ind, +/- confidence limits and Median for Wh, U, Wu, Ban +/- lower and upper quartil).
There are two groups of populations: populations with globular shells and a closed umbilicus (JO, EN) and populations with flattened, umbilicated shells (KSW, HK, ZI, GE, PE). Populations KSW and HK are characterized by extremely flat shells, provided with an open umbilicus. Populations ZI, GE and PE (with more or less flattened and umbilicated shells) vary mainly in shell size and shape.

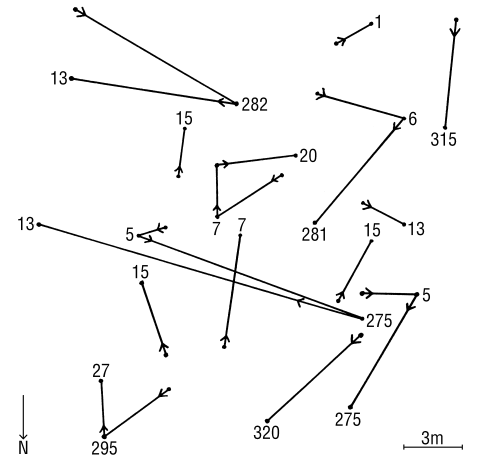


Fig. 5: **Dispersal:** Individual movement patterns of adult *Arianta arbustorum* in population KSW. N = fall line, inclination = 30°. Numbers are time intervals in days between two consecutive findings. Mean value of all distances covered = 4.16m, s.d. = 4.09m (n=403), no direction seems to be preferred.

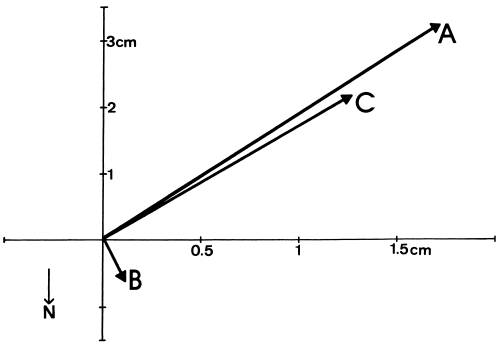


Fig. 6: **Dispersal:** Mean vectors of dislocation (distance and direction) of adult *Arianta arbustorum*. N = fall line, inclination = 30°. A: consecutive findings within summer season (n=205), B: recaptures after hibernation (n=77), C: sum vector. The sum vector (C) indicates, that vagility in population KSW is low. There is a tendency to move uphill in summer, possibly as a compensation for (passive) dislocation in winter.

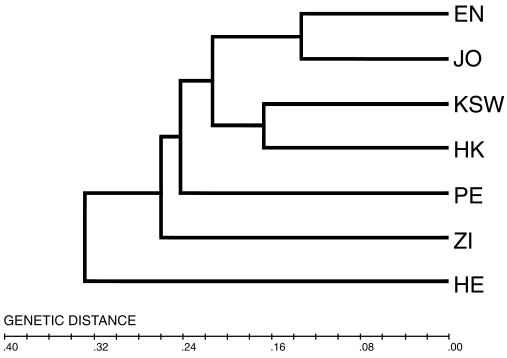


Fig. 7: **Genetics:** Cluster analysis (UPGMA). Coefficient used: CAVALLI-SFORZA & EDWARDS (1967) arc distance. Cophenetic correlation = 0.901. All populations are extremely polymorphic (P = 80% - 100%). No correlation between shell characters and different allele frequencies was found. Gene flow between the populations is small (F_{ST} = 0.134). In combination with the observation from population KSW we favour the interpretation that historical frequencies were maintained and still reflect the initial situation in the Gesäuse mountains.

Literatur

CAVALLI-SFORZA, L.L. & EDWARDS, A.W.F. 1967: Phylogenetic analysis: models and estimation procedures.- Evolution 21: 550-570.

Anmerkung: Vergleiche auch Abstract Bisenberger und Abstract Kleewein, dieser Band.