Zeitschrift: Bulletin de la Société Fribourgeoise des Sciences Naturelles = Bulletin der Naturforschenden Gesellschaft Freiburg

Herausgeber: Société Fribourgeoise des Sciences Naturelles

Band: 77 (1988)

Heft: 1-2

Artikel: Autökologische und enzymelektrophoretische Untersuchungen an zwei "Ecdyonurus venosus-" Populationen : Ephemeroptera, Heptageniidae

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Bibliographie

DOI: https://doi.org/10.5169/seals-308678

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tuaient une dernière mue, donnant naissance aux insectes adultes. Les vols des imagines avaient exclusivement lieu lors des journées chaudes et ensoleillées directement au-dessus du cours d'eau. C'est là également que s'effectuait la ponte des œufs.

Summary

During eight months populations of *Ecdyonurus venosus* FARBRICIUS (Ephemeroptera, Heptageniidae) of two streams of the Canton of Fribourg (Switzerland) with very different geomorphological, topographical and ecological characters were investigated using ecological and biochemical methods. Of the two streams the Gotteron River, situated in a narrow, V-shaped, shaded valley, shows only few flat zones with slowly running water. In contrary, the Sarine River is characterized by large lentic zones and also by a much higher population density.

In both streams two periods of emergence could be observed, one in spring and one in autumn. But it was very astonishing, that already before the autumn period young larvae could be detected, which did not reach the nymphal stage in the same year. That means, that in each of the two places (Gotteron and Sarine River) exist two populations of *E. venosus* with shifted developmental times. As however isoenzyme electrophoresis showed a very similar genetic pattern of all these populations it must be assumed, that inside both places is still a possibility of interbreeding. That means, that these populations are partially bivoltine. After our investigations the existence of only one purely bivoltine population in each place as described by RAWLINSON (1939) and RIEDERER (1981) must be ruled out.

As to the larval distribution pattern in the benthos at least for the individuals emerging in spring always a grouped distribution could be proved. The grouped character increased with the age, i.e. towards the period of emergence (increasing of the index 1/k of ELLIOTT, 1977). The older larvae and the nymphs concentrated near the border in stony, flat zones of slowly running water.

Here the subimagines emerged under water and climbed on such stones which stood out of the water's surface. The emergence depended mainly on the temperature of the water with a limiting lower and a limiting upper level. After a subimagical life of about 3,5 days in the bushes bordering the stream, the imagines swarmed mainly during warm and sunny days directly obove the running water, where also the oviposition took place.

6. Bibliographie

ALBRECHT, M.-L.: Beitrag zur quantitativen Erfassung der makroskopischen Bodenfauna fließender Gewässer. Limnologica (Berlin) *4:* 351–358 (1966).

AMBÜHL, H.: Die Bedeutung der Strömung als ökologischer Faktor. Schweiz. Z. Hydrol. *21:* 135–264 (1959).

ANSCOMBE, F.J.: The statistical analysis of insects counts based on the negative binomial distribution. Biometrics *5:* 165–173 (1949).

AYALA, F.J., POWELL, J.R., TRACEY, M.L., MOURÃO, C.A., and PEREZ SALAS, S.: Enzyme variability in the Drosophila willistoni-group. IV. Genic variation in natural populations of *Drosophila willistoni*. Genetics *70:* 113–139 (1972).

BLISS, C.I., and FISHER, R.A.: Fitting the binomial distribution to biological data and note on the efficient fitting of the negative binomial. Biometrics *9:* 176–200 (1953).

BREHM, J., und MEIJERING, M.P.D.: Fließgewässerkunde. Quelle und Meyer: Heidelberg 1982.

CUMMINS, K.W.: Trophic relations of aquatic insects. Ann. Rev. Ent. *18:* 183–206 (1973).

ELLIOTT, J.M.: The life histories and drifting of the Plecoptera and Ephemeroptera in a Dartmoor stream. J. Anim. Ecol. *36:* 343–362 (1967).

– – : The daily activity patterns of mayfly nymphs (Ephemeroptera). J. Zool. (London) *155:* 201–221 (1968).

– – : Some methods for the statistical analysis of samples of benthic invertebrates. Freshw. Biol. Ass. Scientif. Publ. N° *25* (1983).

– – , and HUMPESCH, U.: A key to the adults of the British Ephemeroptera. Freshw. Biol. Ass. Scientif. Publ. N° *47* (1983).

FERGUSON, A.: Biochemical systematics and evolution. Blackie: Glasgow and London 1980.

FREVERT, T.: Hydrochemisches Praktikum. Birkhäuser: Stuttgart 1983.

GEIGER, H.J.: Enzyme electrophoretic studies on the genetic relationships of pierid butterflies (Lepidoptera: Pieridae). I. European Taxa. J. Res. Lepidopt. *19:* 181–195 (1980).

HEFTI, D., TOMKA, I., and HUMPESCH, U.: An electrophoretic and morphological study of three *Ecdyonurus* species (Ephemeroptera, Heptageniidae) occurring in the British Isles. Syst. Entomol. *13,* 161–170 (1988).

– – , – – , et ZURWERRA, A.: Recherche autoécologique sur les Heptangeniidae (Ephemeroptera, Insecta). Mitt. Schweiz. Entomol. Ges. *58:* 87–111 (1985).

HUMPESCH, U.: Autökologische Untersuchungen zum Entwicklungszyklus von *Baetis alpinus* (PICT.). Proc. Second Intern. Conference on Ephemeroptera: 159–173 (1979).

– – : Effect of temperature on the hatching time of eggs of five *Ecdyonurus* spp. (Epemeroptera) from Austrian streams and English streams, rivers and lakes. J. Anim. Ecol. *49:* 317–333 (1980).

– – : Effect of temperature on larval growth of *Ecdyonurus dispar* (Ephemeroptera: Heptageniidae) from two English lakes. Freshw. Biol. *11:* 441–457 (1981).

HYNES, H.B.N.: The ecology of running waters. Univ. Press: Liverpool 1971.

ILLIES, J.: Emergenz 1969 im Breitenbach. Arch. Hydrobiol. *69:* 14–59 (1971).

– – , et BOTOSANEANU, L.: Problèmes et méthodes de la classification et de la zonation écologique des eaux courantes, considérées surtout du point de vue faunistique. Mitt. int. Verein. Limnol. *12* (1963).

IMHOF, E.: Atlas der Schweiz. Eidgenössische Landestopographie: Wabern-Bern 1978.

KELLER, A.: Die Drift und ihre ökologische Bedeutung. Experimentelle Untersuchungen an *Ecdyonurus vernosus* (FABR.) in einem Fließwassermodell. Schweiz. Z. Hydrol. *37:* 294–331 (1975).

KIMMINS, D.E.: The British species of the genus *Ecdyonurus* (Ephemeroptera). Ann. Mag. nat. Hist. *11:* 486–507 (1942).

LANDA, V.: Developmental cycles of central European Ephemeroptera and their interrelations. Acta entomol. Bohemoslov. *65:* 276–284 (1968).

LEOPOLD, L.B., WOLMAN, M.G., and MILLER, J.P.: Fluvial processes in geomorphology. Freeman: San Francisco 1964.

LINDUSKA, J.P.: Bottom type as a factor influencing the local distribution of mayfly nymphs. Canad. Entom. *74* (1942).

MACAN, T.T.: Methods of sampling the bottom fauna in streams. Mitt. int. Verein. Limnol. *8:* 1–21 (1958).

– – : Emergence traps and the investigation of stream faunas. Riv. Idrobiol. *3:* 79–91 (1964).

– – : A key of the nymphs of British Ephemeroptera. Freshw. Biol. Ass. Scientif. Publ. N° *20* (1979).

MUNDIE, J.H.: Emergence traps for aquatic insects. Mitt. int. Verein. Limnol. *7,* 1–13 (1956).

– – : A sampler for catching emerging insects and drifting materials in streams. Limnol. Oceanogr. *9:* 456–459 (1964).

NEI, M.: Genetic distance between populations. American Naturalist *106:* 283–292 (1972).

PANEK, K: Studien der Migration dominanter Faunenelemente in den Bettsedimenten des Lunzer Seebaches unter besonderer Berücksichtigung tiefen- und richtungsvergleichender Aspekte. Jber. Biol. Stn. Lunz *10:* 83–100 (1987).

PENNAK, R.W., and VAN GERPAN, E.D.: Bottom fauna production and physical nature of the substrate in a northern Colorado trout stream. Ecology *28:* 42–48 (1947).

PLESKOT, G.: Wassertemperatur und Leben im Bach. Wetter und Leben *3:* 129–143 (1951).

– – : Die Periodizität einiger Ephemeropteren der Schwechat. Wasser und Abwasser: 1–32 (1958).

RAWLINSON, R.: Studies of the life-history and breeding of *Ecdyonurus venosus* (Ephemeroptera). Proc. Zool. Soc. London, Ser. B.: 377–450 (1939).

RIEDERER, R.A.A.: Die Eintags- und Steinfliegenfauna (Ephemeroptera und Plecoptera) im Mittellauf der Töß. Eine demökologische Untersuchung. Diss. ETH Zürich 1981.

RUPRECHT, R.: The dependence of emergence-period in insect larvae on water temperature. Verh. Internat. Verein. Limnol. *19:* 3057–3063 (1975).

RÜTTIMANN, M.: Autökologische Untersuchung der Eintagsfliegenlarve *Ecdyonurus venosus* (FABR.) (Ephemeroptera) unter besonderer Berücksichtigung der Aufwanderung. Diss. ETH Zürich 1980.

SCHOLL, A., CORZILLIUS, B., and VILLWOCK, W.: Beitrag zur Verwandtschaftsanalyse altweltlicher Zahnkarpfen der Tribus Aphaniini (Pisces, Cyprinodontidae) mit

Hilfe elektrophoretischer Untersuchungsmethoden. Z. zool. Syst. Evolut.-forsch. *16:* 116–132 (1978).

SCHWOERBEL, J.: Methoden der Hydrobiologie, Süßwasserbiologie. Fischer: Stuttgart 1980.

SCOTT, D.: Ecological studies on the Trichoptera of the River Dean, Cheshire. Arch. Hydrobiol. *54:* 340–392 (1958).

SOUTHWOOD, T.R.E.: Ecological methods with particular reference to the study of insect populations. Chapman and Hall: London – New York 1978.

SOWA, R.: Ecology and biogeography of mayflies (Ephemeroptera) of running waters in the Polish part of the Carpathians. 2. Life cycles. Acta Hydrobiol. *17:* 319–353 (1975).

SURBER, E.E.: Rainbow trout and bottom fauna production in one mile of a stream. Trans. Amer. Fish. Soc. *66:* 193–202 (1936).

THOMAS, A.: Sur la taxonomie de quelques espèces d'*Ecdyonurus* du sud-ouest de la France (Ephemeroptera). Ann. Limnol. *4:* 51–71 (1968).

WARD, J.V.: Bottom fauna-substrate relationships in a northern Colorado trout stream: 1945 and 1974. Ecology *56:* 1429–1434 (1975).

WISE, D.H., and MOLLES, C.: Colonization of artificial substrates by stream insects: Influence of substrate size and diversity. Hydrobiologia *65:* 69–74 (1979).

ZURWERRA, A., METZLER, M., and TOMKA, I.: Biochemical systematics and evolution of the European Heptageniidae (Ephemeroptera). Arch. Hydrobiol. *109:* 481–510 (1987).

– –, und TOMKA, I.: Beitrag zur Kenntnis der Eintagsfliegenfauna der Schweiz (Insecta, Ephemeroptera). Bull. Soc. Frib. Sc. Nat. *73:* 132–146 (1984).

– –, – –, and LAMPEL, G.: Morphological and enzyme electrophoretic studies on the relationships of the European *Epeorus* species (Ephemeroptera, Heptageniidae). Syst. Entomol. *11:* 255–266 (1986).