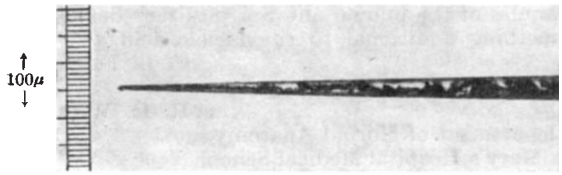

Fig. 2

relay will close the cathode circuit of the valve (*EF*50) and allow anode current to flow which will keep the relay closed. This anode current passing through R_1 (100 Ω) biases the valve 2 volts negative. The voltage necessary to drive 30 μamp. of current through the electrode is then found by closing S_2 and adjusting the voltage of the battery (V_p). If now the voltage of the battery is temporarily doubled, R_2 can be increased until sufficient negative bias appears on grid 1 to suppress the valve. With R_2 in this position, the voltage is reduced to the plating value and the relay depressed manually. Since the bias on grid 1 is now less negative, the relay holds and plating begins. As soon as the electrodal resistance falls at the completion of plating, grid 1 becomes more negative because the current rises, and the valve is suppressed with the consequent breaking of the plating circuit. The plating voltage was generally 12 V.; the plating time differed from electrode to electrode, but was of the order of half an hour. The final resistance of the electrode is much less than 1,500 ohms at capillary diameters of about 10 μ (exterior) but rises appreciably at smaller diameters. A typical micro-electrode is shown in Fig. 2 in transmitted light.

Dr. Thomson has authorized me to state that silver-filled electrodes, produced by the above method, have enabled him to pick up single-fibre potentials from the rabbit's optic nerve.

My thanks are due to Miss M. Lander, without whose patience and enthusiasm the development of the micro-electrode would have been much slower.

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[1] Weale, R. A., *J. Physiol.*, **112**, 4*P* (1951).

Distribution of British Freshwater Amphipoda

The following unpublished data and comments on the distribution of British freshwater gammarids supplement those given by Dr. H. B. N. Hynes[1].

Eucrangonyx gracilis (S. I. Smith) was found already to be well established in the Midlands in 1938, when I collected it in Northants, near Oundle, at Tewkesbury, Glos, in the River Avon, and in three localities in Warwickshire. The latter included the Stratford-on-Avon canal and the canal reservoir at Earlswood. It is clear that the canal system has provided this species with an easy means of dispersal. It would be interesting, by a systematic examination of canals, to ascertain the northward limits of its range.

Although towards the north of Britain *Gammarus pulex* (L.) tends to be replaced by the northern *G. lacustris* Sars, the latter species has not so far been found in the Lake District, where, largely through the efforts of Dr. T. T. Macan, a number of *Gammarus* samples have been collected from a variety of localities. All have proved to be *G. pulex*. The species abounds in some high mountain tarns, even in igneous rock areas where the water has very low mineral content (but not very low *p*H). Last summer, in company with Dr. Macan, I found a thriving population at Brownrigg Well, a spring high up on the shoulder of Helvellyn, at the height of 2,850 ft.

So far, the most northerly *G. pulex* I have seen were from Elcho, near Perth. Samples from small lakes in a limestone area of Sutherland, where *G. pulex* might have been expected if anywhere in this region, contained *G. lacustris*. It may be anticipated that *G. pulex* will be missing from much of northern Scotland as it is entirely from Ireland.

G. pulex has been identified from a number of subterranean habitats, in localities from Yorkshire to Devon, evidently breeding normally in absence of light and green plants. In general, however, the underground waters in which it is found are in close contact with the subaerial drainage system, and where colonization from outside could readily occur.

Gammarus tigrinus Sexton appears to have a peculiar, rather restricted, distribution, split between the West Midlands and north-west Ireland. The late Mr. R. Elmhirst had a large unnamed sample of *Gammarus* from Lough Neagh, collected in 1934 by R Menzies, which, to my surprise, proved to be a pure population of immature and young adult *G. tigrinus*. I had previously seen (and still possess) specimens collected by Mr. R. MacDonald at Ballykelly, Co. Down.

It is now quite clear that *G. tigrinus* has no special need for water of peculiar mineral composition, although it can flourish in such waters (for example, at Droitwich Spa, etc.). The characters of young adults are not nearly so well defined as those of the fully mature male[2], and the species can readily be confused with others. I can confirm the correctness of Dr. Hynes's "tentative identification" of the Irish specimens, to which he refers, in the National Collection, having seen them recently. The interest of this species, unknown elsewhere, is that it is not closely related to any other European form, its nearest relatives being found in North America. It is, in fact, extremely close to the marine littoral *G. annulatus* S. I. Smith. It is thus very probably, like *Eucrangonyx gracilis*, a recent introduction from the New World.

Of the subterranean genus *Niphargus*, three species have long been recognized from Britain, but recently a fourth, new to science, has been discovered in a limestone cave near Buckfastleigh, south Devon, where it was first collected by Brigadier E. A. Glennie during explorations by the Cave Research Group. A description is now being completed. It is an unusually small species, its nearest relatives on the Continent being probably the aberrant *N. arndti*, from Silesia, and *N. nolli*, from mid-Rhineland (separated by Schellenberg as *Niphargellus*[3]). But the relationship is not very close, and the new species is somewhat isolated from any of the numerous forms which have been distinguished in recent years.

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[1] Hynes, H. B. N., *Nature*, **167**, 152 (1951).
[2] Sexton, E. W., *J. Mar. Biol. Assoc.*, **23**, 543 (1939).
[3] Schellenberg, A., *Zool. Anz.*, **122**, 245 (1938).