

TWO SPECIES OF MAYFLIES REPRESENTING SOUTHERN GROUPS OCCURRING AT WINNIPEG, MANITOBA (EPHEMEROPTERA)

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In 1941 the author published the description of *Campsurus manitobensis*,¹ a new species from the vicinity of the junction of the Assiniboine with the Red river at Winnipeg, Manitoba (Ide, 1941). This is the farthest north that a representative of this typically South and Central American genus has been taken. To this occurrence is now added that of *Pentagenia vittigera* Walsh, four male individuals of which were collected along the bank of the Assiniboine river within a short distance of its junction with the Red river in the city of Winnipeg. This record of July 12, 1950 is the first for a member of this genus of large burrowing mayflies from Canada.

Pentagenia vittigera has been reported in the literature (Needham *et al.*, 1935) from Illinois, Kansas, Iowa, Missouri, Tennessee, Texas, Arkansas and Minnesota and *P. robusta* Mc. D., the other known species, from its type locality at Cincinnati on the Ohio river only, (McDunnough, 1926). With the exception of Texas the states from which *P. vittigera* has been reported are either all or in part drained by tributaries of the Mississippi river and the localities given are either on or adjacent to these tributaries. The Texas records are from Austin and Bryan on the Colorado and Braxos rivers respectively both of which flow into the Gulf of Mexico south of Galveston. Judging from the localities represented, *P. vittigera* is an inhabitant of larger rivers. Hannibal, Missouri, one of the sites, is on the main Mississippi river above St. Louis.

The locality at Winnipeg is an isolated one under present conditions of drainage. When, however, hydrological and geological factors are taken into account the extension of a Mississippian faunal element into the Red river drainage is not surprising.

The Red river flows northward from near the headwaters of the Minnesota river, a tributary of the Mississippi river, a distance of over five hundred miles through Minnesota, and Manitoba to its outlet into Lake Winnipeg north of the city of Winnipeg. The river, through most of its length, has a slack gradient of a little less than one foot per mile (Upham, 1920). At Winnipeg the Red river and its tributary from the west, the Assiniboine, are slow flowing

streams of large size with turbid waters and bottoms of fine silt. The bottom provides conditions suitable for the burrowing nymphs of this species and of *Tortopus*, *Ephoron*, and *Hexagenia* which also occur there.

Because of the northward flow, slack gradient and large volume, the water maintains a more even temperature and the mean temperature rises to a higher level in summer than would the water of smaller rivers in Manitoba and particularly than those flowing from other than southern points of the compass. The water is exposed to insolation for a long period during its slow flow from the south and the water heated at the surface is thoroughly mixed resulting in a large volume of warm water, cooling little as it flows northward. The thermal conditions in the water created by this transport of heat northward ensures continuously warm water providing a long season for growth of insects, a condition which is probably similar to that obtaining further south in the larger tributaries of the Mississippi. In this manner a habitat suitable for these southern insects has been extended to this comparatively northern region in Manitoba.

There is a possibility that the two species of mayflies under discussion have been introduced into the Red river across the divide separating it from the Minnesota river. This is improbable, however, when their limited power of flight and short duration of aerial stages are considered. These insects also have a strong tendency to remain in the near vicinity of the place from which they emerged and this species is apparently restricted to the large downstream reaches of rivers.

Changes in the drainages in the past are pertinent in the present situation. The geological history of the Red river has been intensively studied and the results demonstrate that, following the recession of the ice sheet this river was a tributary of the Minnesota river and thus drained southward into the Mississippi. Upham (1920), along with other authorities, shows that glacial Lake Agassiz, covering the present lakes Winnipeg, Manitoba and Winnipegosis at a time in its history when the outlet to Hudson Bay was dammed by the receding ice of the Wisconsin lobe, emptied southward along the Red river valley to the Mississippi. Considering the valley

¹*Tortopus primus* (McDunnough): see Burks 1953.

which it cut, this stream had a slack gradient similar to that of the Red river. There was, therefore, continuity of aquatic habitat in the main river itself and also into the tributary rivers which were in all probability similar for both the Red river and its precursor. When the flow was reversed with removal of the ice dam from the Nelson river and the Red river came into existence it seems entirely probable that Mississippian faunal elements of the main glacial river and of its tributaries then became part of the fauna of the new drainage by Hudson Bay.

The aquatic insects herein referred to may well have been introduced in recent geological time to this drainage from the Mississippi by this stream piracy. A similar case is illustrated by some of the clams of the family Unionidae, which because of their completely aquatic habit and dependence on fishes for distribution are a more reliable criterion than are the aquatic insects. Baker (1928) lists the following species from the Red river: *Fusconaia flava* (Rafinesque), *Megalonia gigantea* (Barnes), *Amblema costata* Rafinesque (sensu latu), *Quadrula quadrula* Rafinesque, *Anodonta grandis* Say, *Anodontoides ferussacianus* (Lea), *Leptodea fragilis* Rafinesque, *Proptera alata megaptera* (Rafinesque). He also lists some additional species from Lake Winnipeg for example *Lasmigona complanata* (Barnes) and a subspecies *L. c. katherinae* (Lea) and *Anodonta grandis* Say, the first being also recorded from the Nelson river. *Lasmigona costata* Rafinesque is listed by him for Manitoba, *Ligumia recta latissima* (Rafinesque) for Winnipeg and *Ligumia ellipsiformis* (Conrad) from the Red river by quotation from Simpson (1914). Many of these species are typical of the Mississippi drainage and are found beyond the present limits of this drainage area only in streams or lakes which were in the past either a part of the Mississippi watershed or in streams or other bodies of water which have since become associated with it. An example of this is illustrated by the distribution in Ontario of *Amblema costata* in Lakes Erie, St. Clair and

Huron, in the Niagara river and some of the rivers flowing into them, (La Rocque and Oughton, 1937). This species and the others of the genus are typical Mississippi forms and are presumed to have migrated into some of the waters of Ontario at a time during the recession of the Wisconsin ice sheet when the outlet of the glacial antecedents of the Great Lakes was into the Mississippi, a stage which persisted with breaks until some time during the life of Lake Algonquin, the last of the glacial lakes, (Leverett and Taylor, 1915).

Similarly *Pentagenia vittigera* is a Mississippian form in the northern part of its range in the United States and it is suggested that it is in this northern locality at the present time because of a combination of the suitable hydrological conditions of the river and the change in drainage from a large river draining southward into the Mississippi to one draining northward to Hudson Bay.

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