attack human beings. This, however, has not been my experience, for in spite of the cold towards the end of October I was freely bitten by mosquitos when sitting out in the open at sunset.

The duration of the larval stage is said to vary from a few days to weeks, being influenced by the temperature, etc. I have now in my possession *Anopheles* larvæ collected in September, 1900. They have been kept apart from others and under close observation for five months. Another lot of larvæ—*Culex* and *Anopheles*—collected on October 25th last are still quite vigorous and healthy.

EFFECTS OF TEMPERATURE ON MOSQUITO LARVÆ.

In the *Handbook of Gnats* Major Giles writes:

Both males and females, but especially the latter, are much longer lived than is usually believed to be the case, and it is by the survival of hibernating impregnated females in sheltered nooks that the continuity of the species is ensured, for, as far as I know, none of the larvæ are capable of enduring even a temperate winter. In the North-West Provinces and Punjab, although the winter air temperature may not fall so low as in Europe, the radiation at night is so powerful as to occasionally freeze the small collections of water most favoured by mosquitos, and in any case to render them too cold for the survival of the larvæ. The larvæ cannot survive cold, and in Europe certainly any that have not completed their metamorphosis by the return of winter die.

On October 25th, 1900, when I collected larvæ, there was a slight sprinkling of snow on the ground, and the frost sufficed to freeze the water in the pools and form a crust of ice about one-eighth of an inch thick; yet the larvæ in these partly frozen pools were alive and quite active. I even observed mosquitos emerging from the nymphæ, and after a short interval able to take the wing. No precautions were taken to maintain a high temperature in the room in which my collections of larvæ were kept, the window being kept open. For the past three weeks snow has fallen and remained on the ground. During this time the water in my mosquito larvæ bowls has not been over 44° F., and on some occasions was found to register 33°. On the morning of February 14th the temperature of the room was 29°. There was a crust of ice on the surface of the water in bowls. The larvæ were still moving freely in water under the ice. A few *Culex* larvæ had, whilst coming to the surface to breathe, become frozen, and were adherent to ice. When set free they were motionless, but recovered shortly. A teacup containing *Culex* and *Anopheles* larvæ was placed outside on a ledge of the garden wall. There was about 6 inches of snow at the time on the ground. After forty-eight hours' exposure to cold the larvæ were alive. The cup was next placed in a large bowl and ice packed round it. After the lapse of eight hours the larvæ remained alive. Salt was then mixed with the ice, and the water in the cup was slowly frozen. As long as there was any water unfrozen the larvæ moved about, but succumbed when the freezing advanced and all the water was rendered solid. Another experiment was undertaken with a fresh lot of larvæ with the object of subjecting them to a prolonged low temperature. This was done by intermittent freezing, freezing being always stopped before all the water was solidified. The larvæ were alive after four days of such exposure to cold; they were killed on the night of February 14th, when all the water in the cup became solidified by the extreme cold. Doubtless death was caused in these instances by embedding in ice preventing access to air and interfering with breathing.

The mosquito pools at Torphins were examined on February 9th to ascertain how the larvæ had fared over the winter and fared under natural conditions. These pools, like the surrounding country, were found to be under cover of snow. This state of matters had existed for two weeks. With the aid of a spade, the snow, which varied in depth from 18 inches to 2 feet, was removed from the pools. The lower layer of snow was frozen hard, and formed an arch over the shallow water in pools. In spite of this long subjection to cold, I found many live mosquito larvæ, both *Culex* and *Anopheles*. In addition to these I obtained larvæ of the *Dira*, and also specimens of what I took to be larvæ of the dragon fly and May fly, besides other minute water insects. No mosquito nymphæ were found.

In summer and autumn I kept mosquitos alive for periods varying from weeks to two months, the food given being juices of fruits or syrup from jams. In November I had about forty mosquitos, and they all died off as the cold season advanced. A careful search was made for hibernating females, but without success. In sheltered places, however, many

species of other dipterous flies were observed throughout winter.

Those larvæ that changed into pupæ late in November and December, and even January, died before completing their metamorphosis. Seemingly, in this phase great cold is not borne well.

One sees it generally stated and accepted that the adult mosquito is able to survive the rigours of winter in a state of hibernation, and when the season becomes warm turns active, lays eggs, and so provides for the perpetuation of the species. So far as I am aware there is no actual proof of this. From the observations I have made—the extreme prolongation of the larval stage and the power shown by the larvæ to withstand low temperatures—it seems reasonable to infer that it is really the larvæ that provide for the continuation of the species through winter in these northern countries, and probably throughout Europe. It is during winter that one may hope to do most towards exterminating mosquitos. Larvæ could be searched for and found with greater ease than those mosquitos that are said to hibernate in out-of-the-way corners.

In kerosene oil we have a most efficient larvicide, but through imperfect methods of application complete success has not been gained. The usual directions are that the oil should be applied and renewed from time to time. This intermittent application, however, is not right. Better results would follow by suspending a vessel containing the kerosene oil over the water, and arranging for the discharge of oil a drop at a time. The outflow being regulated so that there would be a continuous film of oil on the surface of collections of water near dwellings that cannot either be drained off or filled in.

A CASE OF RECURRENT ALCOHOLIC PERIPHERAL NEURITIS.

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CONSIDERABLE diversity of opinion appears to exist among physicians regarding the part alcohol has played independent of, or in conjunction with, arsenic in the recent outbreak of peripheral neuritis. Indeed, some appear quite sceptical, and doubt whether alcohol has had any influence. Dr. Reynolds, for instance, in his evidence before the Royal Commission appointed to investigate the subject, is reported to have said, "He had never seen pure spirit produce alcoholic neuritis. He knew one lady who took a bottle and a-half of whisky a day, and another a bottle of whisky a day, and neither had neuritis"; and, as if to emphasise his scepticism, he concluded by saying, "Typical instances of this disease had occurred among spirit drinkers, though none had come within his own experience."

Now, it is my conviction that I have seen many cases, and among them the following incontestable example, remarkable for the fact that the intense neuritis, which affected almost the whole muscular system, was caused by a very moderate amount of alcohol.

First Attack.

On June 1st, 1887, Miss X. was sent to me from the country suffering from absolute paralysis of the extensors of the hands and feet. With difficulty she dragged her feet along the ground, and the hands, as shown in Fig. 1, were utterly powerless. The deltoids, muscles of the arms, the buttocks, and the muscles of the legs were atrophied.

At first sight the case looked like one of lead poisoning, but the concomitant symptoms of this affection were entirely absent, and on investigation it was found that no source of lead-poisoning existed.

This lady had for some time been peculiarly circumstanced—domestic duties of a most exhausting nature, continuous throughout the day, and extending to the early morning hours of the next, reduced her strength and debilitated her constitution. In contending against her weakened physical condition she had recourse to stimulants. Whisky, in moderate quantities, was the stimulant she resorted to, never dreaming she was taking more than was good for her, or than modesty or rectitude permitted; and indeed the quantity daily taken had been so moderate I doubted whether it could have caused the paralysis, and suspected that this might possibly be of idiopathic origin. At that time my friend the late Dr. Ross was greatly interested in the subject, and I got him to see her, and after a prolonged and exhaustive examination, he concluded that it was a typical case of alcoholic neuritis. Subsequent events proved the correctness of his diagnosis.

After total abstinence from alcohol for four years, during which electricity from both the continuous and interrupted currents was used regularly, the patient, having passed through a chequered time of pro-

gresses and relapses, almost completely recovered power in the extensors of the hands, shown in Fig. 2. The feet at the same time showed similar improvement, and the muscles of the body generally developed.

Second Attack.

From this time, residing at the seaside, until 1898, this lady enjoyed perfect health; was bright, active, and became engaged to be married. Then unhappily she received a terrible shock, and again was compelled

Fig. 1.—When first seen, June, 1887. Absolute paralysis of extensors.

Fig. 2. After four years, July, 1891. Shows restoration of extensor power.

to undertake most arduous domestic duties, which made exhausting calls on her strength. Again she had recourse to stimulants, but this time in more moderate quantities than before; three glasses of burgundy was her usual daily limit. This, however, was sufficient in her exhausted and shocked nervous condition to cause a recurrence of the neuritis; and Fig. 3 shows the paralysed condition of the extensors of the hands when I saw her in May, 1898. The dropping of the feet, however, was not nearly so marked as in 1887.

Now, after two years' total abstinence and the renewed use of elec-

tricity, she has once more regained perfect power over her limbs and her usual health. Fig. 4, from a recent photograph, shows the restored muscular development of the extensors.

Such a case as this raises the question whether scepticism as to the power of alcohol to produce peripheral neuritis may not easily be carried too far. On the other hand, I have for many years past been in the habit of treating cases of

Fig. 3.—May, 1898. Shows recurrent paralysis of extensors.

chorea in children and adolescents with large doses of arsenic, amounting in many cases to 45 minims of Fowler's solution daily, and in two instances only have I observed the approach of neuritis, indicated by numbness of the thumbs and finger-ends. Again, in cases of pernicious anæmia, where arsenic has been pushed in large doses, month after month, no sign of neuritis has appeared; and, lastly, in a case of sarcoma of the face, which I attended in conjunction with Mr. Walter Whitehead, no less than 90 minims of the solution was given

Fig. 4.—September, 1900. Shows second restoration of extensor power.

daily, for I cannot recollect how long, without producing any paralytic symptoms.

I conclude that alcohol is responsible for much that has occurred in the recent outbreak, and that in a great measure the arsenic has acted on systems saturated with alcohol, much as a candle-end or a resin lighter would on a smouldering fire.