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Before closing I may perhaps say that the Agave and Yucca fibre industry is at present in its infancy. If intelligently followed it might become a very prosperous enterprise in many of our tropical possessions where cheap labour and poor soils prevail. It might become still more prosperous by the use of economical machinery and intelligently managed plantations. In the *Kew Bulletin* for March and October 1889 the interesting accounts of the development of the fibre industry in the Bahamas will show what can be done by intelligent and systematic action.

I have to thank Mr. D. Morris, F.L.S., for the very kind assistance he has given me in tracing the correct botanical names of the plants here discussed.

(Signed) W. S. BOOTH.

CLXXI.—A FOREST PLAGUE IN BAVARIA.

(*Liparis Monacha*.)

A terrible pest to pine forests has made its appearance in Bavaria. It is there known as the "Nonnen," and is caused by the caterpillar of a moth (*Liparis Monacha*). It appears that these caterpillars have regularly attacked the forests on the Continent for the last 200 years or more. They have made their appearance after long intervals, but the destruction caused by them has been calamitous. In Bavaria alone it is estimated that the loss to the revenue for woods and forests next year will amount to about 40,000*l*. In some of the forests attacked by the "Nonnen" the excreta from the caterpillars has been noticed to lie six inches deep. The injuries committed by the caterpillars are often followed by those of bark beetles.

The following correspondence, forwarded to Kew by the Foreign Office, gives a detailed account of the attack on the Bavarian forests :—

FOREIGN OFFICE to ROYAL GARDENS, KEW.

SIR,

Foreign Office, 21st August 1890.

I AM directed by the Secretary of State for Foreign Affairs to transmit to you, to be laid before the Director of the Royal Gardens at Kew, the accompanying despatch and enclosures respecting the so-called "Nonnen" pest in Bavaria.

I am, &c.

The Assistant Director,
Royal Gardens, Kew.

(Signed) JAMES FERGUSSON.

[Enclosure.]

MR. DRUMMOND to FOREIGN OFFICE.

MY LORD,

Munich, 18th August 1890.

A VERY serious pest of the insects known as *Liparis Monacha* or "Nuns" has lately been causing great destruction to the Pine and Fir Forests in certain districts of Bavaria. This serious calamity to the kingdom had its first germs two years ago, when the Government, according to a statement made by the Upper Bavarian Agricultural Association, took measures to prevent it spreading. On the other hand,

if public opinion is correct, the foresters, instead of carrying out hand and eye work in the forests, did not visit them as often as it was their duty to do. In any case the fact remains that the forest administration has been defeated by the "Nuns," and although everything is being done to extirpate them by killing thousands daily, it is now reckoned that nature alone, "winter frosts," can rid the forests of the pest.

It is calculated that the loss to the revenue from woods and forests for the next financial year will amount to 800,000 marks (40,000*l.*), and it is even feared that the amount may be larger, as where forests are injured by any special cause the "Bark beetle" follows and attacks the diseased wood, this will probably result next year.

The enclosed translations of extracts taken from the "Münchener Neueste Nachrichten" show the extent of the present calamity, and give a chronicle of the destruction caused by the "Nonne" and other insects since the year 1449.

Cuckoos, swallows, and other birds, as well as wasps and other insects, have assisted in getting rid of the "Nuns." Torches and bonfires have also been used with success. The electric light with a specially constructed exhauster has been used with some effect, the result being so far satisfactory that the majority of "Nuns" destroyed by this means were female.

I have the honour to enclose herewith copies of a pamphlet issued by the Bavarian Forest Administration, giving a full description of the *Liparis Monacha*, its habits, and the best means for its destruction.

I may mention that Munich has been invaded by the "Nonne" in immense numbers, and that in some places the people were obliged to retreat from them.

I have, &c.

(Signed) VICTOR DRUMMOND.

The Marquess of Salisbury, K.G.,
&c. &c. &c.

[Enclosure No. 1.]

NOTE from the Bavarian Forest Administration (Finance Department)
on the "Nonne."

The Forest Department of the Ministry of Finance state that the "Nonne" plague is now extended over nearly all Bavaria south of the Danube in scattered tracts. The infested districts are estimated at about 10,000 hectares. The fertility of the insect is so great, and its numbers so enormous, that the Forest Department fear that no measures of destruction are of any avail. "We stand powerless before the immensity of the pest." The insect attacks chiefly the pine and fir with which Bavarian forests abound, but in default of these it does not despise the beech, oak, and other forest trees, and is even known to feed on shrubs and garden plants. It never attacks corn or wheat, and, curious to say, there is one tree it will not touch, viz., the horse chestnut.

The means of destruction are various. Forest bonfires of worthless wood form an easy means within reach of all communes, &c. The insects are attracted by the fire and are smothered in the smoke, but only a comparatively small number are killed. Children and boys are also sent out to destroy the insects. From September to April similarly the eggs can be found in the bark and destroyed, and in April the very young caterpillars can be more easily killed, all these however are mere partial measures. The only efficient general measure seems to be the

cutting down of whole forests when much infested, in which case the remedy is almost worse than the disease. One other method is used by the State, but not within reach of Communes, therefore not described in the official pamphlet. A large electric light is placed in the forest by night and attracts thousands and hundreds of thousands of "nonnen" to the mouth of a large funnel through which a rapid exhaust current of air is forced, sucking in the insects by thousands into a hole under the earth where they are buried. Even this is only a partial measure, for in a forest containing perhaps a hundred millions of "nonnen" it is not much to destroy 200,000 or 300,000.

The Forest Department consequently fear an even greater extension of the plague next year, and an even worse danger is threatened, viz., that of the "bark beetle," which, burrowing under the bark, is much more injurious to the wood and more difficult to kill. It is always found that where the forests are injured by any special cause the "bark beetle" follows and attacks the injured or diseased wood in vast numbers, and this is greatly feared will be the case in 1891. Great numbers of trees are being felled, but to avoid flooding the market with timber and causing a ruinous fall in prices, contracts and agreements have been entered into with neighbouring forest owners and the large timber dealers by which only certain quantities will be sold at a time, and prices will be maintained. The yearly "cut" in the *other* Bavarian forests has also been much reduced.

[Enclosure No. 2.]

TRANSLATION of an Article in the "Münchener Neueste Nachrichten" of August 10th, 1890, entitled "Chronicle of the Destruction of Forests through the 'Nonne' and other Wood Insects."

Just as men and beasts are from time to time carried off in multitudes by epidemics, which epidemics it has not yet been found possible entirely and finally to suppress by art and science and by doctors and veterinaries, in like manner the trees of the forest are now and then attacked and destroyed by forest insects. Fortunately these vanish as a rule as quickly as they come, by the operation of natural agencies. This is the only consolation we have in view of the desolate condition to which many of the pine forests of Germany, and in particular of Bavaria, have been reduced by the horrible devouring caterpillar the "Nonne."

Before now in earlier centuries our woods have been attacked by similar calamities, and yet the German forests grow green and thrive, and yield, year by year, higher rents. This may serve to calm too anxious minds and to correct the views of those who are so ready with their judgments, and who ascribe the blame of the misfortunes which have fallen on the forests solely to the forest officials.

However, the present "Nonnen" pest has nothing particular to do with the forest training nor the new forest organisation, nor with the style of forest husbandry in vogue, nor with the aims of modern woodcraft, for it is well known that destruction by insect plagues occurred hundreds of years ago, and therefore at a time when the trees grew of themselves in primæval fashion and there was no question of forest training nor of any particular forest husbandry. Besides this, the fact is not in dispute that the destructions caused by insects are much less intense in forests of mingled broad leaved and needle-leaved trees; but this money-loving world unfortunately insists on quick-growing pine forests instead of safe slow-growing woods.

1. In 1449 and 1450 a considerable plague of caterpillars attacked the Nürnberg forests, for which no remedy could be found. (*Nürnberg. Chronik.*)

2. In 1479, the May beetles, which had caused great destruction round Lausanne, were cited before the spiritual court, and an advocate from Freyburg granted them, and after mature consideration they were outlawed. (M. Stettler's *Schweizer Chronik*, p. 278.)

3. In 1502 so many caterpillars swarmed in Brandenburg that they not only destroyed the gardens but also ate the trees so bare that they stood up in the woods like broomsticks. (Angeli, *Annales March. Brand.* 1416-1596.)

4. In 1506 the Kurmark suffered a similar misfortune. (*Mannsfelder Chronik.*)

5. In 1719 the caterpillars ate up the tops of the fir trees near Freyburg in Saxony to such an extent that they withered up. At the same time all sorts of insects crept into the same places (probably bark beetles). (Von Karlowitz, *Answeisung zur Wildenbaumzucht.*)

6. In 1725, in the Anspach district, 1,000 acres of forest died away through the pine insect. (Kob. *Ursuche der Waldtrocknitz.*)

7. In 1726, near Nürnberg, 600 "morgens" of young wood were eaten up by caterpillars. (*Nürnberg. Chronik.*)

8. In 1729, in Thuringia, there were so many moths and butterflies that they almost flew into the mouths of the passers-by. (*Nürnberg. Chronik.*)

9. In 1734, in the Anspach and Nürnberg districts the pine insects caused great injury in the forests. (Meyer's *Zeitschrift für des Forst und Jagd wesen.*)

10. In 1737 the caterpillars made such a dreadful invasion into the Thuringian Forest, that in a small part of the Duchy of Meiningen in 1742, 2,985 cords of dead wood still lay on the forest; but by good fortune at this time glass furnaces were introduced, which absorbed the wood killed by the "nonnen" pest. (K. v. Sprengelsen, *Topograph.* etc.)

11. In 1776 the caterpillars devoured great districts in the Ukraine, where they had been quite unknown for 40 years. (Hennert.)

12. In 1783 and 1784, in the Fichtelgebirge (Bayreuth district), the "nonnen" caterpillar caused great damage to the old and young pine trees. The bark beetle followed and finished the trees. (Kob.)

At the same time the "nonne" and other insects were busy in the Vorpommersche Forest.

In 1783-86 the bark beetle caused immense devastations in the Harz and other German districts, and in the Harz this continued until the end of the century.

13. In 1783-88 and 1790-93 the great pine caterpillar caused great damage in the district of Soran, often a single branch bore a whole "schock" of caterpillars.

In the Görlitz Heath also the caterpillar plague was very considerable, and more than 18,000 cords of wood were consumed for fuel.

14. In 1791-96, in the forests of Kurmark, although for five years no trace of the caterpillar had been found, 650,000 "morgens" of pine forest were devoured by the great pine caterpillar and the seventh part totally destroyed. (Hennert.) The bark beetle also took part in this destruction. The pest also spread to Mecklenburg, Saxony, and Bohemia.

15. In 1795–96 several thousand “morgens” of fir woods were destroyed in Prussian Lithuania and West Prussia. (Hennert.)

16. In 1796, near Amberg, in the Oberpfalz, the pine woods were so attacked by the pine spider, that some 100,000 cords of wood were killed. (V. Linker.)

17. In 1794–97 the “nonnen” caterpillar appeared in Vogtland, viz. :—in the pine and fir forests of Lobenstein, Schleiz, Ebersdorf, and Saalburg, and worked vast destruction, so that the loss was reckoned at 2,000,000 cords of wood, and the plague also threatened the neighbouring forests of Altenburg, Electoral Saxony, Saalfeld, and Schwarzburg.

Bechstein, in his *Forest Insectology* (1818), describes the great destruction caused by the “nonnen” caterpillar in 1794–97 in Vogtland, Lithuania, and West Russia, and gives figures which correspond exactly with our present situation. Seventy-two years ago he wrote as follows :—

“It is horrible to travel in those districts where these caterpillars swarm. Many thousands crawl up and down the trees. One cannot take a step without treading on a number of them. There is a perpetual rain of their excreta, which often lies six inches deep, and being dissolved by the rain, collects in puddles, which diffuse a pestilential stench. One can form no idea of the magnitude and terrible nature of the destruction. Fortunately Nature herself stopped the pest through a kind of dysentery which attacked the caterpillars in the beginning of June 1797. This deadly sickness was attributed to a kind of mildew. The caterpillars collected together in great thick clumps, four to six inches across, the excreta became pale, the intestines dirty, and so they died, leaving behind them a disgusting stench.”

As to the measures of prevention and suppression of that day, they hardly differed from those in use now. Bechstein, in 1818, recommended, 1st. protection and encouragement of insectivorous birds; 2nd. protection of useful insects which attack and pursue the “nonnen”; 3rd. scraping the eggs off the trees with brooms and scrapers with long and short stems; 4th. picking off the moths, caterpillars, and cocoons (in 1796 the Prussian district administration at Hof caused 1,838,000 female butterflies to be caught, and paid 6 kreuzers for every thousand); 5th. the lighting of a number of small bonfires on dark nights (for it is well known that butterflies are attracted by the moonlight), and they paid in Bayreuth in 1796 for one night’s maintenance of fire and bringing wood 5 groschen; 6th. isolation of the districts attacked by broad paths and ditches; 7th. cutting off in March and April of the branches nearly to the vertical, and burning them; 8th. cutting down of whole standing trees, and burning of the branches and bark; 9th. removal of moss and litter from the forests and burning, if eggs or caterpillars are found therein.

18. In connexion with the injury caused by the “nonnen” in this century, we may briefly mention here the extensive “nonnen” plague of 1839–40 in Upper Suabia (Württemberg), which ravaged many hundreds of “morgens” of pine forest. The same thing was repeated in 1855, and at the present moment is appearing almost in the same spots in a very serious manner. But the most considerable “nonnen” pest of all took place in Russia, and spread from 1845–1868 in a most devastating manner over Poland, Lithuania, and East Prussia. The invasion in East Prussia began suddenly in 1853, in the night of July 29–30, and covered a superficies of about 60 German square miles in the administration of Gumbinnen, after it had already crossed over

in 1851 and 1852 the southern boundary of the administration of Königsberg. At that time the "nonnen" moths were driven by a storm into the sea while on their way, so that the insects were thrown up by the waves on to the coasts for a distance of 10 German miles in a bank 7 feet wide and 6 inches thick, and were used as manure by the coast inhabitants. The extent of the ravages in Russia at that time was 6,400 German geographical square miles, in East Prussia 600 ditto, total 7,000. At the very least 55,000,000 Prussian cords of wood, or 184,000,000 cubic metres of wood, became the prey of "nonnen" and bark beetles.

These few examples may suffice to show that the "nonnen" have made their appearance in former centuries in large numbers, and have generally disappeared with equal suddenness. The present catastrophe will likewise come to an end, after causing heavy losses, though it may possibly return many years later. But we possess no radical remedy against the "nonnen," and it seems doubtful if we shall ever find one. At all events it is the duty of the forest managers, forest owners, the Government, and the whole population to come to close quarters in every possible way with this dangerous visitor, even although Nature herself up till now has proved herself the best helper, and may continue so in future. When, however, the present evil will be conquered that God alone can certainly tell. Let us hope for the best.

CLXXII.—OKRO FIBRE.

(*Hibiscus esculentus*, L.)

The plant variously known as okro, okra, gobbo, gombo, and quim-bombo, is widely cultivated in the tropics for its horn-like pods, or seed vessels, which are used as a table vegetable. They are exceedingly mucilaginous, and are made into soups and sauces. The ripe seeds are sometimes parched and used as a substitute for coffee. The plant is an annual herb, with a stout hairy stem from 2 to 5 feet in height. The leaves are large, three- to five-lobed, coarsely toothed, with petioles about 6 inches in length, more or less bristly. The flowers are yellow, with a brown or crimson centre. The fruit is pyramidal-oblong, 6 to 10 inches long, and about $\frac{1}{2}$ to 1 inch in diameter, with five prominent ribs and smooth. The spherical seeds are grey or greenish, obovate, and covered with fine hairs.

The Okro (*Hibiscus esculentus*, L.), *Abelmoschus esculentus*, W. & A., is probably a native of India, but it is now naturalised or cultivated in all tropical countries. Vilmorin distinguishes two varieties in cultivation: the long-fruited green okro, and the round-fruited okro. In the latter the fruits are short and comparatively thick, being about 2 inches long and nearly 2 inches in diameter, and blunt at the ends rather than pointed. There is said to be a sub-variety of the long-fruited green okro with pendulous pods.

The okro has long been known in India and elsewhere to yield a long silky fibre, the breaking strain of which, according to Roxburgh, is 79 pounds dry, and 95 pounds wet. Specimens of Indian okro fibre in the Kew Museums resemble hemp in colour and texture. It is evidently well adapted for making ropes, twine, and sacking, while the residual portions could be utilised for paper-making.