

How we tackled tree health problems during the twentieth century and are dealing with problems in the 21st

John Gibbs

During that period the biggest story was, of course, the Dutch elm disease epidemic :

it entered the public consciousness

Poems were written about it:
'The rust of advancing elm
disease'

It featured in April 1st pranks on
the radio: Spike Milligan had a
longish talk as a professor
Northcote in which, in the
punch line, the red-haired
protagonist catches the disease

And the reason was of course
the sheer impact in terms of
trees lost - of the order of 18
million in the first 10 years –

and the complete change that
occurred to many landscapes

English elm in the Vale of Severn 1971



English elm in the Vale of Severn 1976



- when it comes to operations against the disease, a common comment is 'too little was done too late'.
- An easy jibe but one that hides the complexity of the situation
- Here we have a disease caused by a fungus that invades the wood but which then colonises the bark and is disseminated by bark beetles when they emerge to feed on the twigs of healthy trees.

It is conspicuous and easily
recognisable

Here are the classic symptoms on
the foliage – yellow and browning
and shepherds; crooks and in the
xylem - a stain in the outermost wood



Why then did it take so long for action to be taken when outbreaks were noted in the late 60s

The principal reason was that we already had Dutch elm disease:

And it had been the subject of careful study by my highly respected predecessor Tom Peace

FORESTRY COMMISSION

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**The Status
and Development of
ELM DISEASE
in Britain**

By T. R. PEACE, M.A.

FORESTRY COMMISSION

Peace showed that while Dutch elm disease had killed quite a lot of trees in Britain after its arrival in the 1920s,

the impact had lessened over time
And many trees survived an attack

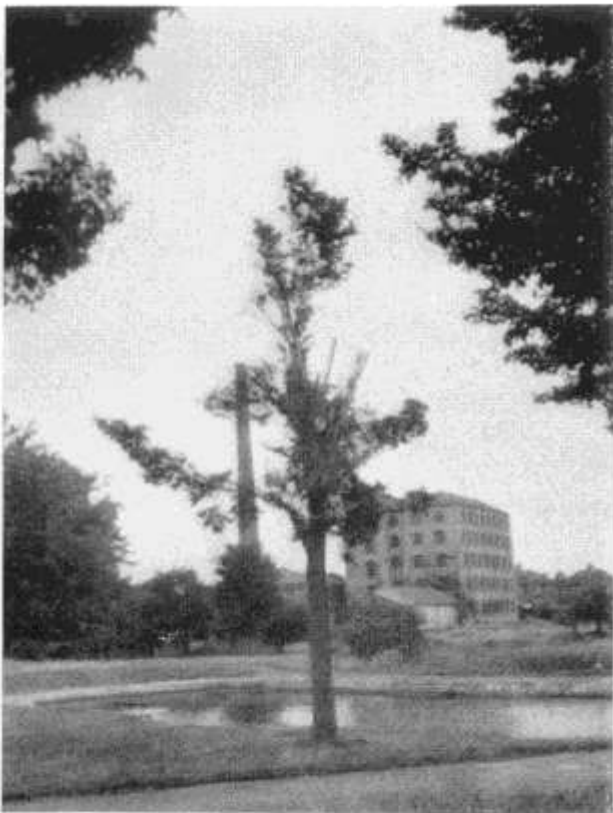


PLATE 45. 1940, severe active symptoms, heavily pruned as a result of previous attacks.

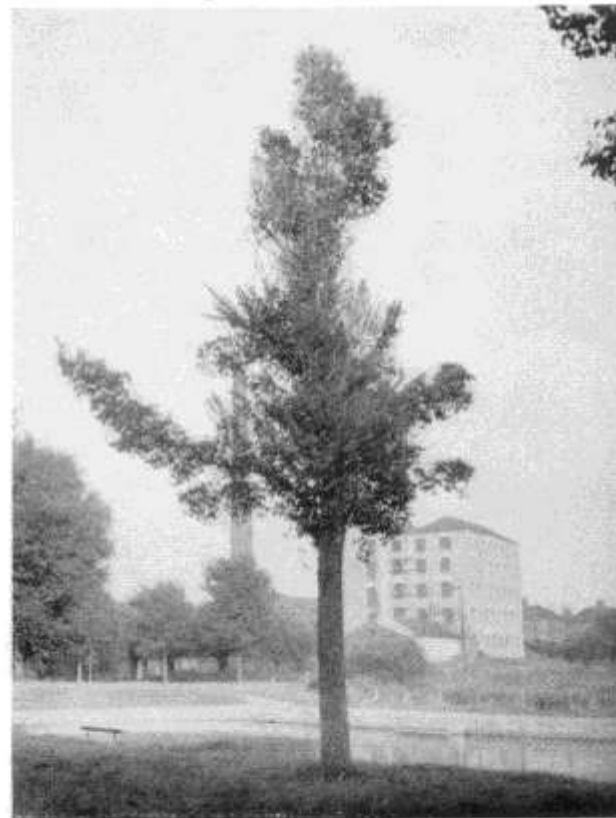


PLATE 46. 1941, moderate active symptoms, but has made considerable recovery growth since the previous year.

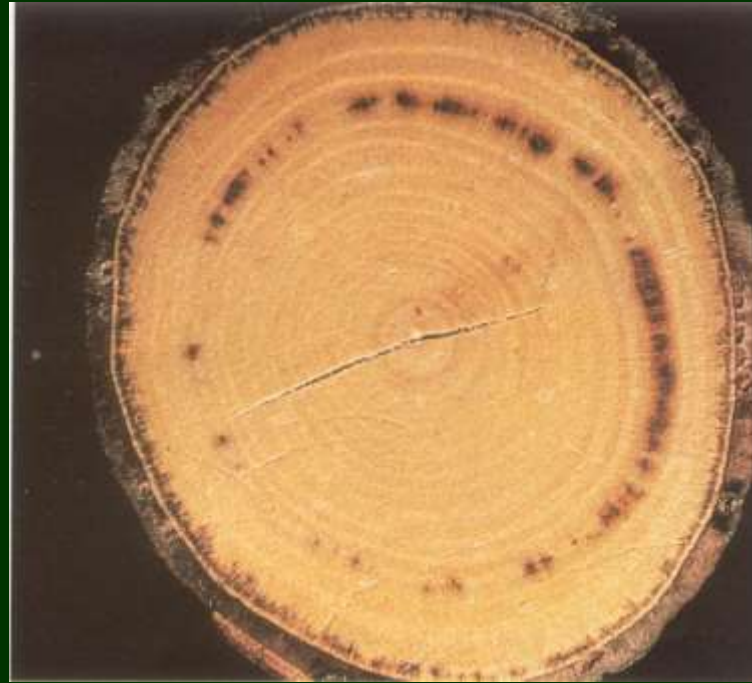
Wheatley elm in Trowbridge



PLATE 49. 1949, no active symptoms, recovering, but its top died in a severe attack in 1948.



1972



Elm showing a buried infection and then several years of healthy growth

- In the Bulletin Peace recommended that diseased trees should not be cut down but should be given the chance to recover and said 'unless it completely changes its behaviour it will never bring about the disaster once considered imminent'
- So not surprisingly the outbreaks of the disease that started to show up at the end of the 60s were viewed in the light of Peace's study.

I joined the FC as a pathologist in 1970 to work on a root disease but in the summer of that year I did engage with the DED to some extent.

In 1971 I had a real baptism of fire as I:

- Set up the first Survey to gain quantitative information
- Started to investigate fungicide injection as a control measure for valuable trees
- Conducted the first infection experiments with the fungus from 'outbreak' and 'non-outbreak' areas

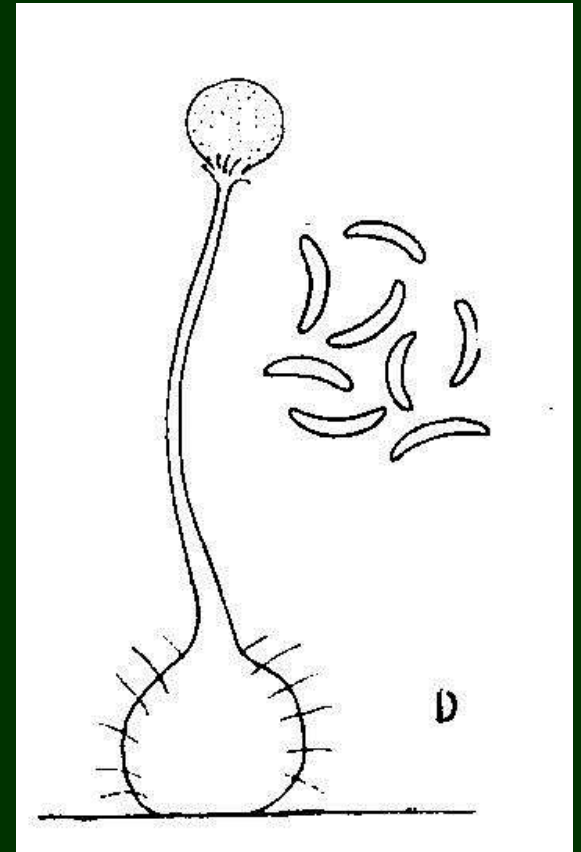
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Infection tests on young elms



Clive Brasier showed
we were working
with two species:

Ophiostoma ulmi
and
O novo-ulmi



And it was not long after, in 1973, that Clive Brasier and I obtained evidence that the aggressive strain had been introduced on logs of rock elm from Canada



Sanitation felling under local authority orders



But the disease had too many strings to its bow

Not only was the aggressive strain being rapidly spread by the vector bark beetles but also it was travelling through the inter-connected root systems that linked so many elms .

O novo-ulmi spread via bark beetles and through the roots



Infection can be spread from a branch blown from a healthy tree.

It may be colonised by bark beetles as it lies unnoticed in the grass. The beetles will carry the fungus into the bark and it will be on the next generation of beetles when they emerge to feed on healthy trees

Natural processes did influence the rate of disease development as it moved further north and west. For example, it encountered greater proportions of wych elm which, as my colleague Joan Webber showed, although very susceptible to the fungus, is not so attractive to the beetle.

And as she also showed there is another fungus *Phomopsis oblonga* which lives in the outer bark of healthy elm and invades the inner bark after the tree has died of DED.

If it does this beetles cannot breed in the bark and the diseased tree does not become a source of infection itself.

Inner bark of diseased Wych elm
Colonised by *Phomopsis oblonga*



Failure of *Scolytus* larvae to develop in *Phomopsis*-colonised bark



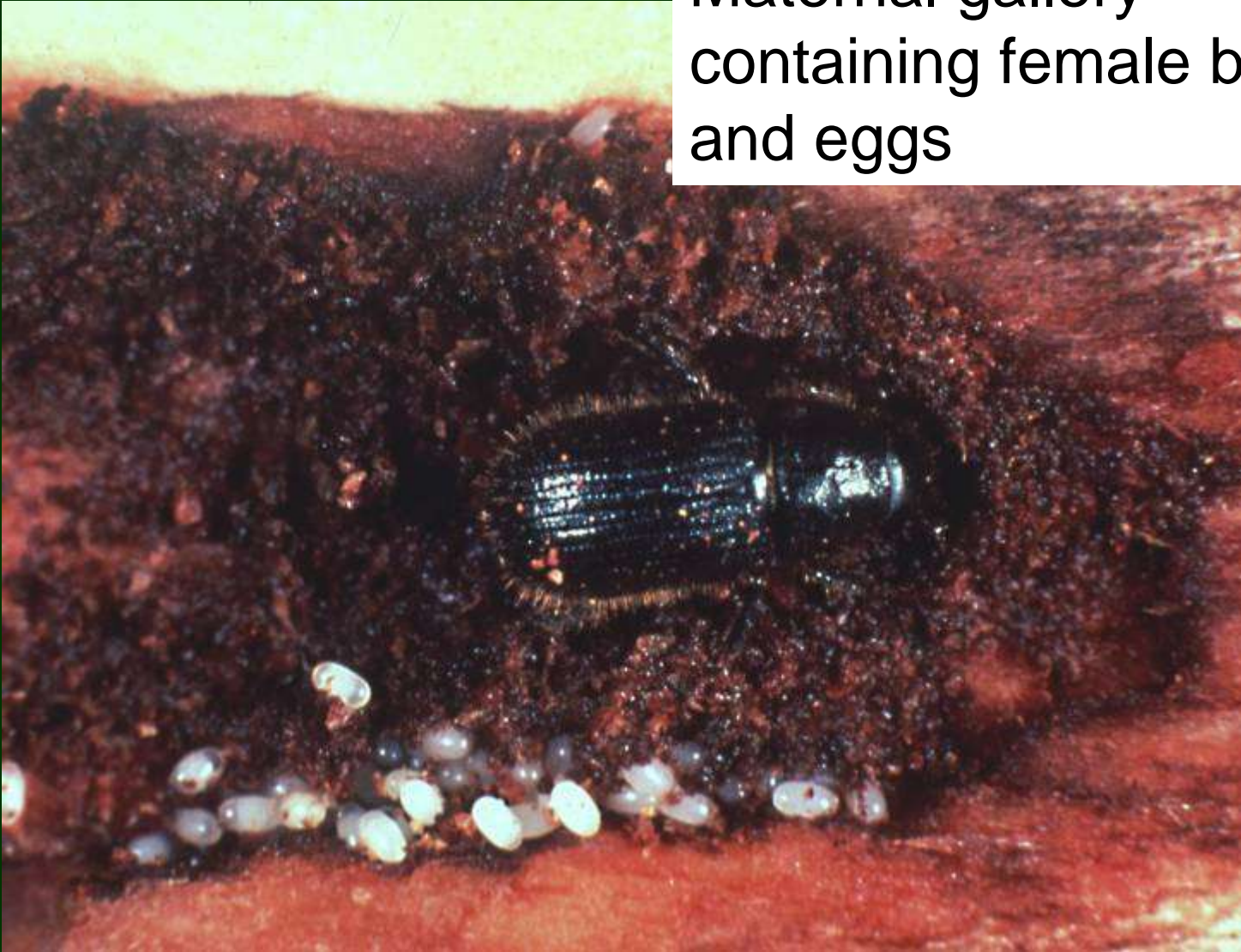
Dendroctonus micans

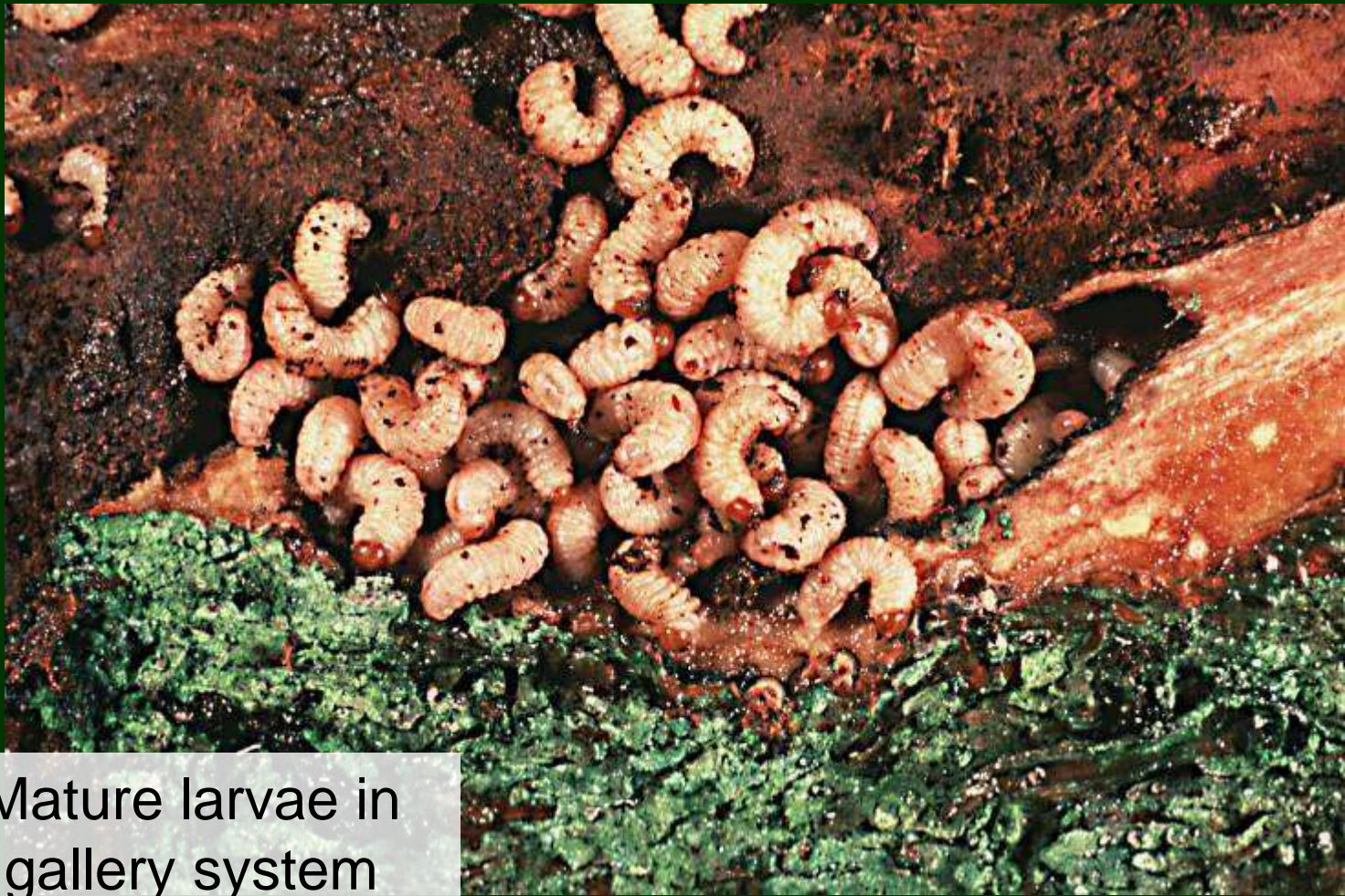


Dendroctonus micans



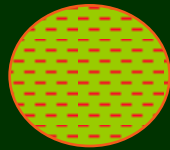
Maternal gallery
containing female beetle
and eggs





Mature larvae in
gallery system

Dendroctonus micans
control area with
restrictions on spruce
movement



Rhizophagus grandis



The predator *R. grandis* larvae feeding on
D. micans
larva



This story has a much happier outcome than DED. Collaborative research across Europe lead to the rearing and release of the specific predatory beetle *Rhizophagus grandis* and this has resulted in significant declines in *D.micans* populations since 1986.

Indeed in 2005 the log control orders were rescinded

Information courtesy of my friend and former colleague Hugh Evans

My assessment of 20th Century Experience

- Be ahead of the game

- A research outfit will be respected if it has people with the skills to analyse and assess a new finding quickly and effectively
- A good example is provided by the FC response to the Phytophthora disease of alder that was first recognised in 1993

Phytophthora disease of alder



Phytophthora disease of alder



- Bob Strouts of the Disease diagnostic Team knew Phytophthora symptoms well and diagnosed the problem,
- I was able to devise systems to get data on disease severity and spread,
- Clive Brasier was able to show that the fungus was new and of hybrid origin, very likely having come into existence in a tree nursery – whence it had spread!

‘Forest pathologists do grow on trees’

- But it takes time!

My assessment of 20th Century Experience

- Tell it like it is

I realised how vital it was that we were not thought to be part of an organisation that was hide-bound by secrecy – because we weren't.

The key event was one which I have already described: namely the discovery by Clive Brasier and myself that the DED epidemic owed its origin to the importation of rock elm logs from Canada. And who had the responsibility of regulating log imports – The Forestry Commission, of course



I well remember the meeting at which the release of this information was discussed

Was there a little thought somewhere that perhaps it could be kept quiet. Well if there was, it was quickly suppressed and we were encouraged to go ahead and publish in the famous journal Nature – with all the publicity that this would – and did – bring. The overall effect of this were entirely on the positive side!

(Reprinted from *Nature*, Vol. 242, No. 5400, pp. 607-609,
April 27, 1973)

Origin of the Dutch Elm Disease Epidemic in Britain

WE have shown that two culturally distinguishable groups of *Ceratocystis ulmi* are present in Britain, one "fluffy" and aggressive, the other "waxy" and non-aggressive, and have presented evidence that the former is responsible for the current epidemic of Dutch elm disease¹. It is of obvious interest to consider the origin of the aggressive strain.

There seem to be two chief alternatives: either that the aggressive strain arose by genetic change within an endemic

Presented by John Gibbs

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@ John Gibbs