

## Learning objectives:

1. Biodiversity
2. Invasive species
3. **Structure of forest insect communities and ecological guilds**
4. Population traits of forest insect pests
5. How forest insects respond to abiotic drivers
6. How forest insects respond to biotic drivers: plant quality
7. How forest insects respond to biotic drivers: competition
8. How forest insects respond to biotic drivers: natural enemies
9. Ecological management of insect pest populations

### 3. Structure of forest insect communities and ecological guilds

Learning objectives:

1. species-area relationships
2. major guilds and their traits
3. host specialization guilds

The species-area relationship based on the island biogeography theory (MacArthur & Wilson 1967). Assuming that the area of a host tree corresponds to an 'island':

$$\text{number of species} = (\text{area of host})^z \quad 0.3 < z < 0.4$$

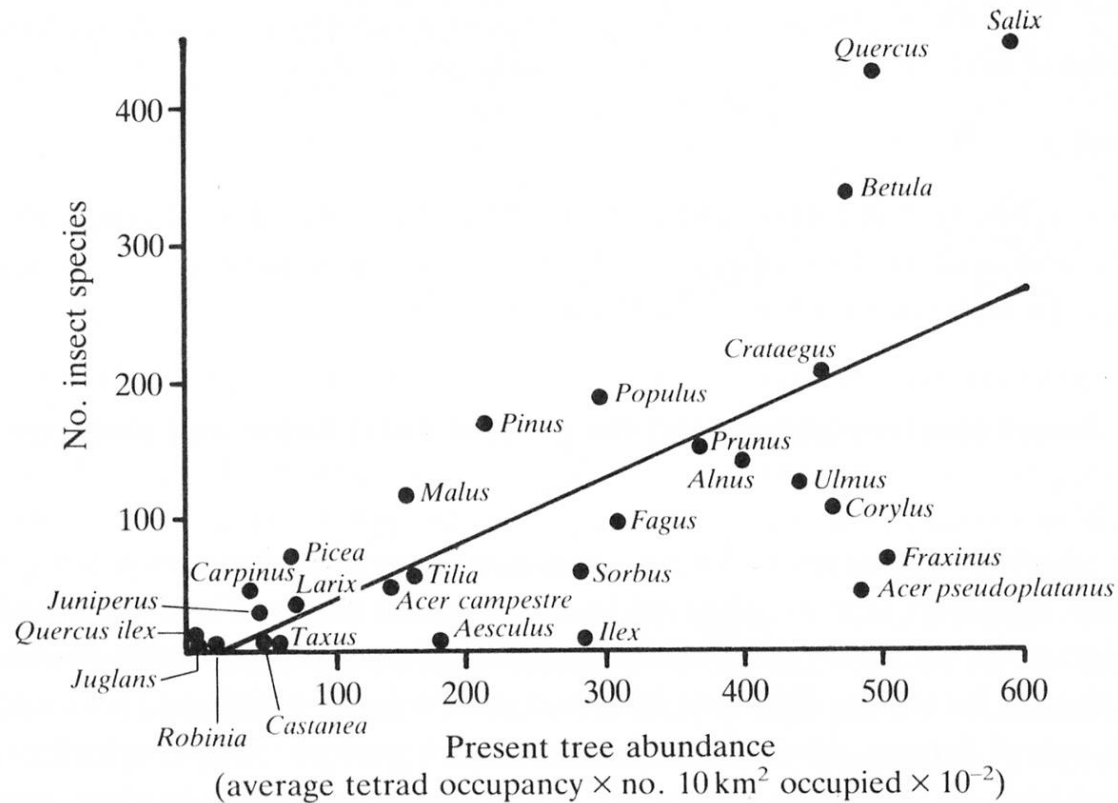


FIG. 2.3. The number of insect species associated with trees in Britain in relation to their estimated present abundance (from Kennedy and Southwood 1984).

**Table 2.1.** *The number of insect species on broad-leaved and coniferous trees that occur in both Britain and Russia, showing differing relative abundance in the two countries*

Tree	Numbers of insect species	
	Britain	Russia
Broad-leaves		
Oak ( <i>Quercus</i> )	284	150
Willow ( <i>Salix</i> )	266	147
Birch ( <i>Betula</i> )	229	101
Hawthorn ( <i>Crataegus</i> )	149	59
Poplars ( <i>Populus</i> )	97	122
Apple ( <i>Malus</i> )	93	77
Alder ( <i>Alnus</i> )	90	63
Elm ( <i>Ulmus</i> )	82	81
Hazel ( <i>Corylus</i> )	73	26
Beech ( <i>Fagus</i> )	64	79
Ash ( <i>Fraxinus</i> )	41	41
Lime ( <i>Tilia</i> )	31	37
Hornbeam ( <i>Carpinus</i> )	28	53
Holly ( <i>Ilex</i> )	7	8
Conifers		
Pine ( <i>Pinus</i> )	91	190
Spruce ( <i>Picea</i> )	37	117
Larch ( <i>Larix</i> )	17	44
Fir ( <i>Abies</i> )	16	42

From Southwood 1961.

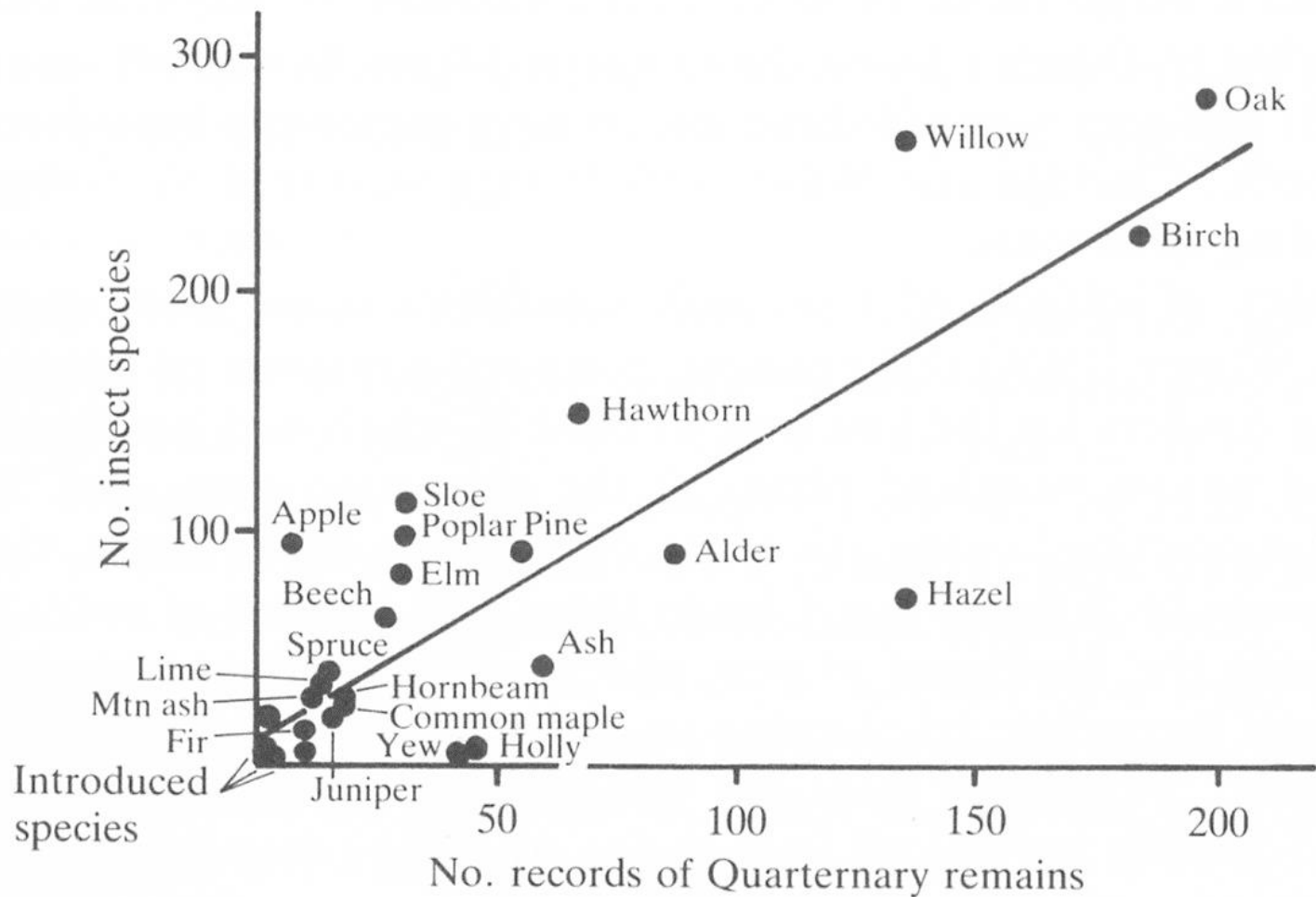


FIG. 2.4. The number of insect species associated with trees in Britain in relation to the number of records of Quarternary remains (from Southwood 1961).

1. Structure of forest insect communities and ecological guilds

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# Feeding guilds and abundance of:

- . Species
- . Individuals
- . Biomass

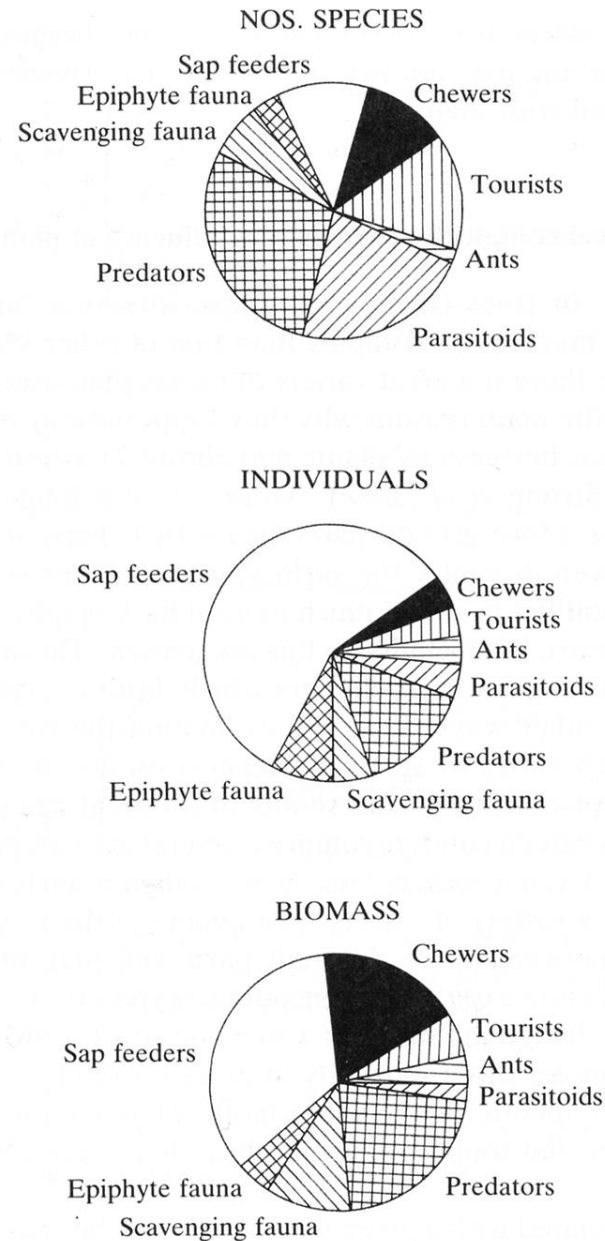


FIG. 2.1. The proportions of the major guilds of arthropods on trees sampled in Britain and South Africa. Ten species of tree were sampled, three of which were common to both countries, namely birch, oak and *Robinia* (from Strong *et al.* 1984; after Moran and Southwood 1982).

## Feeding guilds – examples

- Sap feeders: cell, phloem, xylem
- Defoliators: early season, late season
- Miners: leaf and shoot
- Cone and seed
- Gall makers
- Wood and bark: primary and secondary
- Parasitoids
- Predators
- Scavengers



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- Host

Monophagous: one genus of trees

Oligophagous: one family of trees

Polyphagous: more families of trees