A HERBARIUM FOR FOREST PATHOLOGY

by
Wolf G. Ziller and Daphyne P. Lowe

FOREST RESEARCH LABORATORY
VICTORIA, BRITISH COLUMBIA
INFORMATION REPORT BC-X-22
REVISED MAY 1968

CANADA
DEPARTMENT OF FORESTRY
AND RURAL DEVELOPMENT

FORESTRY BRANCH
MAY, 1968

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A HERBARIUM FOR FOREST PATHOLOGY

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Forest Insect and Disease Survey

Introduction

A report under the same title, issued March, 1963, is out of print and in need of revisions. Since 1963, our herbarium has been moved to a new and modern research laboratory, several herbarium techniques have been improved upon, and Data Processing for Forest Disease Survey has been adopted.

A herbarium is a collection of dried plants. Its primary function is to represent the flora of a region in a form readily accessible for study at any time.

During the past twenty-five years the herbarium of the Forest Research Laboratory, Canada Department of Forestry and Rural Development, Victoria, B. C., has become a valuable asset in the study of tree diseases. From merely a reference collection of a few conspicuous pathogens, mainly decay fungi, it gradually grew in size and now constitutes the largest collection of fungi in the Province, which meets a multiplicity of diversified requirements. Today, most of the collections are contributed by a forest disease survey staff and their many co-workers. The herbarium, referred to internationally by the code letters DAVFP, is included in a handbook (9) of the major herbaria of the world.

A number of booklets are available in which herbarium equipment and techniques are described in detail, including the collecting, identification and preservation of botanical specimens (2, 3, and 13). Nevertheless, little if any published information is available on herbaria designed primarily for forest pathology.

The purpose of this paper is to describe Herbarium DAVFP as a representative example of a herbarium for the study of forest diseases, and thus to provide a guide to forest pathologists.

Inventory and Purpose of Equipment

The Herbarium occupies a floor space of 1000 square feet, most of which is taken up by 37 Herbarium Cabinets in which nearly all specimens are stored. Thirty-three are factory-made steel cabinets with asbestos-insulated double-walls and -doors, of a type widely used in large North

American herbaria (Fig. 1). Each is provided with a three-point catch with lock ventilator holes and 24 shelves with spaces left for circulation of fumigants. Four cabinets are "home-made" by local carpenters and are of plywood construction. They have the same capacity (24 shelves) and approximately the same dimensions as the steel cabinets, but their cost is considerably lower. The main disadvantages of wooden cabinets are that they are not dust-, insect-, fumigant-, or fire-proof, and are of relatively poor workmanship, durability, and appearance.

A specimen to be stored in a Herbarium Cabinet is first placed in a separate permanent container. Small (2 3/4 x 3 3/4 x 2 1/4 inches), medium (2 3/4 x 7 1/4 x 2 1/4 inches), or large (6 x 7 1/4 x 2 1/4 inches) Specimen Boxes (Fig. 1b, c and d) are used for bulky specimens such as the sporophores of most fungi and the cones of coniferous trees. Specimen Boxes are made of cardboard and have no lids.

Small (5 1/2 x 3 7/8 inches, Fig. 12) and large (7 1/4 x 4 1/2 inches) Herbarium Packets are used for specimens of foliage diseases that have been pressed and dried in a plant press. A thin white card in each Herbarium Packet prevents breakage and facilitates handling of the specimens.

Specimen Boxes and Herbarium Packets are placed in heavy cardboard Herbarium Boxes (12 1/2 x 15 1/2 x 5 1/2 inches, Fig. 1a).

The dimensions of all containers are such that Specimen Boxes and Herbarium Packets can be stored in Herbarium Boxes in a variety of combinations and with a minimum waste of space. The Herbarium Boxes fit in the shelf spaces of the Herbarium Cabinets (Fig. 1).

Lichens, mosses, ferns, and flowering plants are mounted on Herbarium Sheets, one specimen per sheet. Herbarium Sheets are made of heavy white paper cut to the standard size of 11 1/2 x 16 1/2 inches. A plastic glue, developed especially for mounting botanical specimens and applied in horizontal ribbons across the specimens (see Rhodora, vol. 57), is used. Specimens mounted on Herbarium Sheets are enclosed in heavy manila paper, Herbarium Folders (Fig. 1e). Several colors of Herbarium Folders are used to indicate the type of specimens they contain, such as major taxonomic groups, regions where the specimens were collected, unidentified specimens, and so forth.

Two types of wooden Display Cabinets are in use. One is 60 inches wide, 84 inches high, and 16 inches deep, provided with 2 glass-panel doors and containing 4 wooden shelves. It provides little protection against insects, dust and fumigants. The other type (Fig. 2) is approximately 3 feet high, 3 feet wide, and 1 foot deep, provided with glass panels and containing plate glass shelves. The latter is custom-made, the tightly fitting panels being bolted together. It has no doors, and is insect-, dust- and fumigant-proof. The Display Cabinets are most suitable for the display of bulky material such as diseased roots, sections of small trees bearing cankers and sporophores of decay fungi.

Fig. 1. Herbarium Cabinet.

Fig. 2. Display Cabinets.

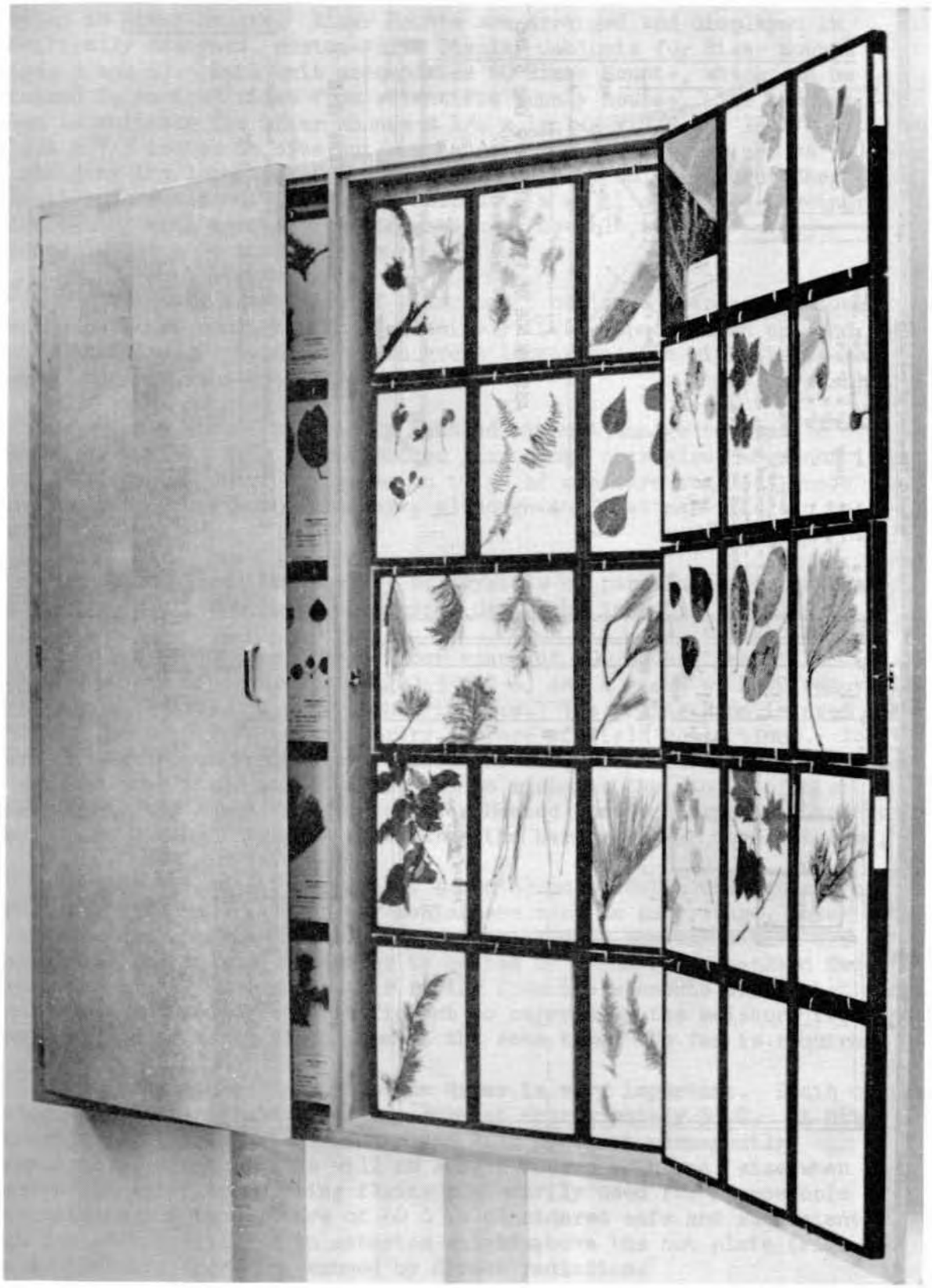
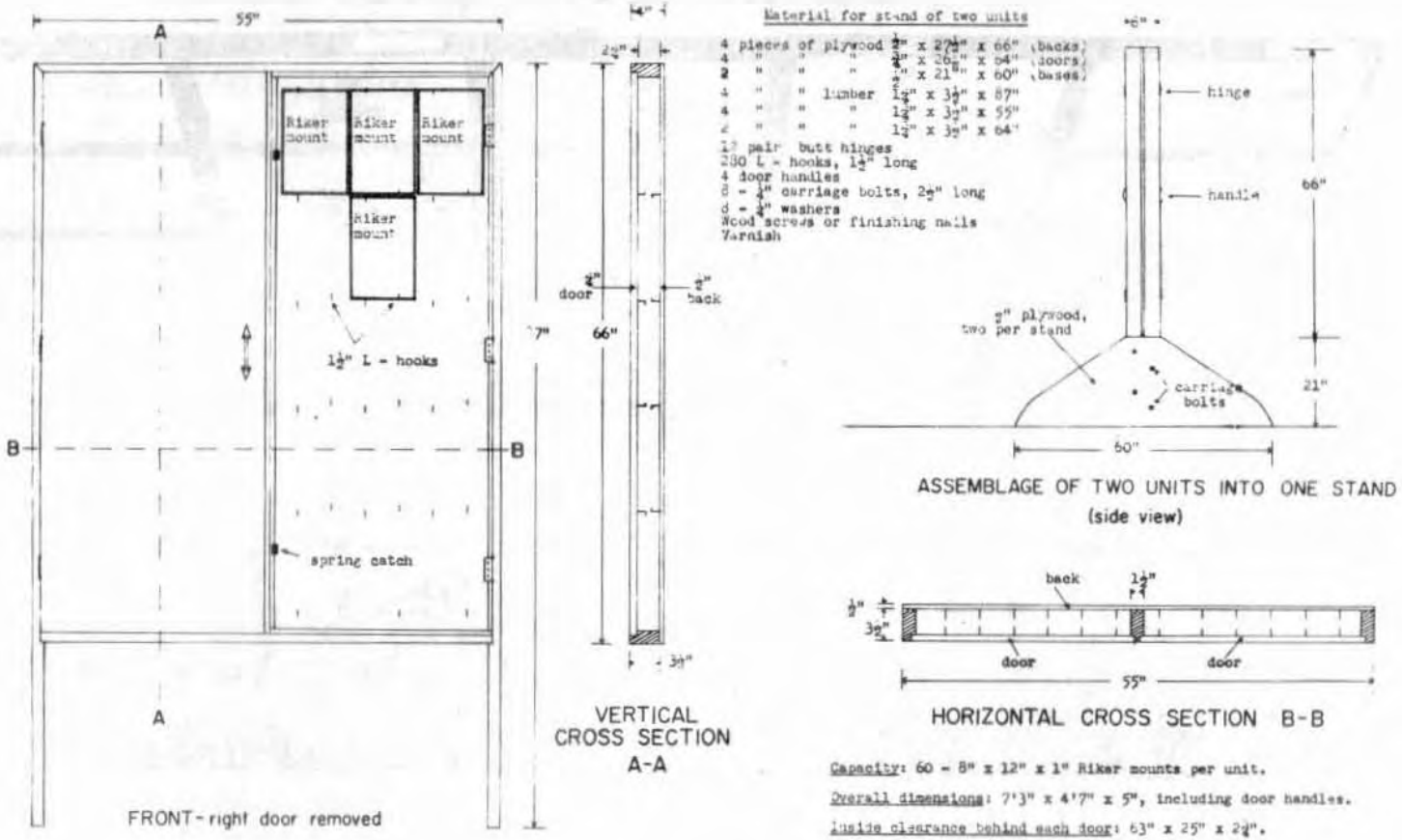


Fig. 3. Display Cabinet for Riker Mounts, photo.



Capacity: 60 - 8" x 12" x 1" Riker mounts per unit.

Overall dimensions: 7'3" x 4'7" x 5", including door handles.

Inside clearance behind each door: 63" x 25" x 2¾".

Fig.4. DISPLAY CABINET FOR RIKER MOUNTS

Dried and pressed plant material is most advantageously demonstrated in Riker Mounts. Riker Mounts are arranged and displayed in specifically designed, custom-built Display Cabinets for Riker Mounts (Figs. 3 and 4). Each unit accomodates 60 Riker Mounts, which can be obtained in various sizes from scientific supply houses. The cabinet shown is suitable for Riker Mounts 8 1/4 x 12 1/4 x 7/8 and 16 1/2 x 12 1/4 x 7/8 inches in size but can be used for different sizes as well by changing the location of the hooks. A unit is only 4 inches deep with the doors closed. It may be bolted to a wall, or bolted together back-to-back with another unit to make up a movable stand (Fig. 4) holding 120 or more Riker Mounts.

The main advantages of Riker Mount cabinets over conventional display cabinets consist of the relatively little space taken up, and the fact that foliage specimens remain green longer because with the doors closed the specimens are kept in the dark.

Riker Mounts are easily handled without damage to fragile specimens within. They can be stored like books on shelves when not in use. Leaf spots, dwarf mistletoe on twigs of conifers and leaf rusts make the best Riker Mount displays, although any flat material can be used.

Naphthalene (moth balls) or crystals of paradichlorobenzene are included with all specimens to prevent damage by insects.

The Drying Room has a floor space of 100 square feet. It contains two Specimen Dryers (Figs. 5 and 6) and 4 racks with 20 removable wire-screen shelves, 14 x 42 inches in size. The Drying Room is used exclusively for drying and temporary storage of field collections. To guard against contamination of valuable herbarium specimens and cultures by insects from field collections, and to minimize the danger of fire spreading to the herbarium from an over-heated Specimen Dryer, a location remote from the culture room as well as the Herbarium has been selected.

The Specimen Dryer (Figs. 5 and 6) accomodates collections of almost any size and shape in any containers such as paper bags, boxes and plant presses: nearly all collections received at the laboratory are heat-sterilized in it. The dryer is heated by means of a standard two-burner hot plate. The heated air rising from the elements of the hot plate creates convection currents sufficient to carry away the moisture from the specimens and heat-sterilize them at the same time. No fan is required.

Temperature control in the dryer is very important. Death of the protoplasm of plants and amimals occurs at approximately 55 C. At high temperatures, the colloidal protoplasm will contract permanently; consequently, plant tissues will no longer return to normal size when immersed in water or mounting fluids customarily used for microscopic examinations. A temperature of 60 C is considered safe and sufficiently high for sterilization. An asbestos shield above the hot plate (Figs. 5 and 6) prevents scorching caused by direct radiation.

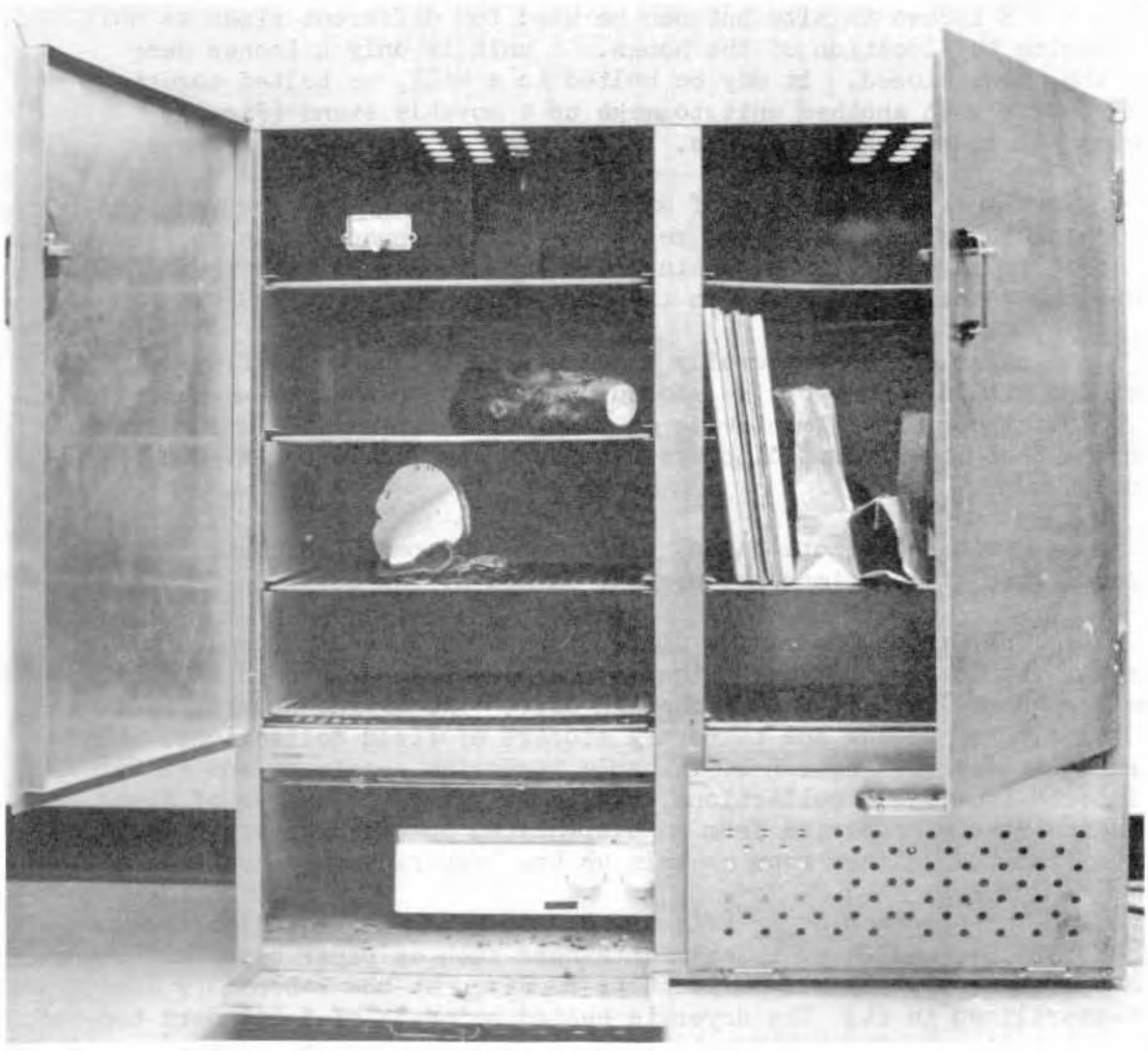


Fig. 5. Specimen Dryer, photo.

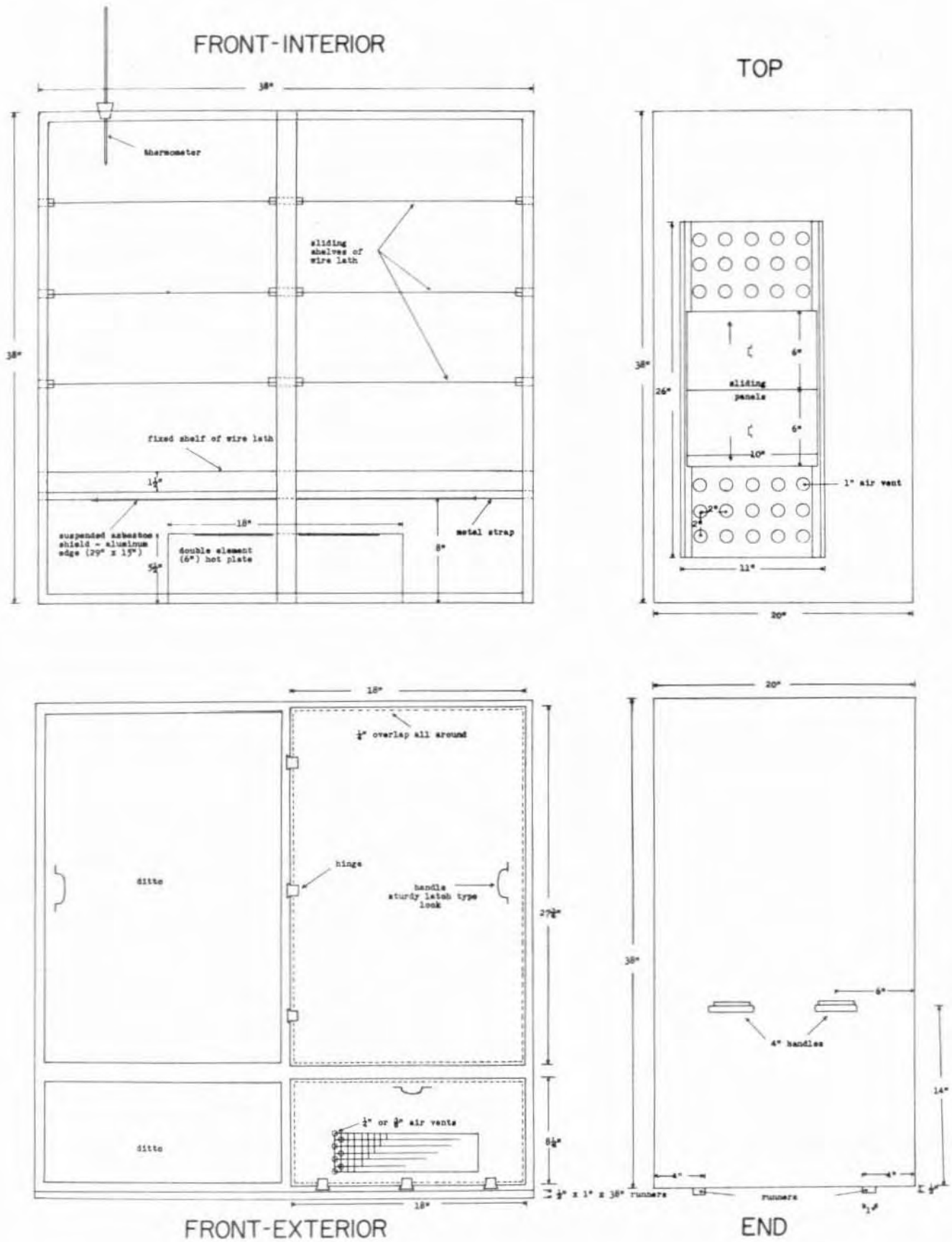


Fig. 6. SPECIMEN DRYER - Aluminum construction - asbestos lined

The temperature is controlled by regulating the rate at which the air flows through the dryer. The air flow is regulated by adjusting the top and bottom vents. The time required for heat-sterilization depends on the size of the collection: for small and thin collections, 8 hours is sufficient; plant presses are left in for 3 days, and large specimens may require up to 30 days.

Two Specimen Dryers as shown in Figs. 5 and 6 have been designed at the laboratory and built by a local firm. Although usually placed in the Drying Room, they have been used temporarily by collectors in auto courts, field stations and Ranger cabins.

Herbarium Sections and their Function

The herbarium is divided into five sections (Table I):

1. Taxonomic Section
2. Demonstration Section
3. Riker Mount Section
4. Surplus and Exchange Section
5. Forest Associations Section

Each section is a separate herbarium in content and function, serving the special purpose for which it was created. Theoretically, a division of a relatively small herbarium into 5 parts would seem to complicate maintenance, restrict accessibility and therefore be unjustifiable. In actual practice, once the sections were established, cost of maintenance became less and accessibility to the specimens was facilitated. Most important of all, specimens of high taxonomic value were saved from misuse, damage, misplacement and loss by confining them to the Taxonomic Section.

The Taxonomic Section is the main section of the herbarium. It contains 66% of the specimens deposited (Table I). All species of plants and all host-pathogen combinations for which there are specimens are represented in the Taxonomic Section. Its purpose needs little definition: it serves to represent the forest flora, particularly of British Columbia, and to provide material for taxonomic and etiologic research in forest mycology. Material better suited for other purposes is filed in other sections.

Specimens of the Demonstration Section are either on exhibit in the Display Cabinets described or kept in storage in Herbarium Cabinets.

Demonstration material is used for a number of purposes: for lectures and courses of instruction to stimulate interest in forest pathology among amateur botanists and students of forest pathology; for photographs to illustrate scientific publications and to familiarize

rangers of the Forest Disease Survey with economically important pathogens they are expected to recognize in the field. A demonstration sample should show both the pathogen and the host symptoms caused by it.

The purpose of the Riker Mount Section and the cabinets designed for it (Figs. 3 and 4) have been described previously.

Specimens fully identified but not required for taxonomic or demonstration purposes are placed in the Surplus and Exchange Section. This section serves a dual purpose, as its name implies.

(a) Specimens are fully available for any purpose to anyone of the laboratory personnel. They may or may not be returned after use, as no records are kept of the contents in this section.

(b) Specimens also may be used in exchange for other specimens, obtained or to be obtained from other herbaria. With an increase in mycological activities at the laboratory, international collaboration and the acquisition of specimens from foreign countries have become more and more desirable.

The Forest Associations Section contains a collection of lichens, mosses, ferns, and flowering plants characteristic of certain forest associations. They are mounted on Herbarium Sheets and enclosed in Herbarium Folders, each folder containing the plants that occur in one forest association. The section made up from surplus specimens was established for the convenience of forest ecologists and foresters who are required to recognize an association in the field by observing the ground cover. A forest association indicates the quality of a site and its suitability for the cultivation of certain tree species. Thirty-one classified forest associations are represented.

The five Sections described contain all identified plant specimens in the Herbarium. In addition, a few representative samples of tree disease symptoms are kept on file. They are classified as Host Symptom Specimens and divided into the following groups:

Physiological Diseases
Chemical Injury
Galls, Hypertrophies, Atrophies, and Fasciation
Mechanical and Insect Damage
Parasites of Unknown Identity

Host Symptom Specimens serve to demonstrate diseases apparent by their symptoms and caused by unknown or other-than-pathogenic agencies.

In addition to herbarium specimens, 440 pure cultures of fungi are kept in stock. The cultures, although not forming part of the Herbarium proper, serve much the same purpose as herbarium specimens of the Taxonomic Section.

Cultural isolations from damaged tissues are necessary because very few forest pathological disorders can be identified on the basis of host reaction alone. The fruiting structures necessary for identification are seldom persistent and are only occasionally present on field collections at the time of examination. Pure cultures of forest fungi are maintained on malt agar slants under refrigeration, for the purpose of identification by comparison with unknown isolates from field collections.

Inventory of Specimens and Species

An inventory of the Herbarium was made in May, 1968 (Tables I and II). It shows that 60 per cent of the species represented and 80 per cent of the specimens deposited are fungi--the main cause of forest disease.

Taxonomic groups with a high percentage of forest pathogens, such as the polypores (Polyporaceae), the rusts (Uredinales) and needle diseases (Hypodermataceae) are best represented. The intensity with which a single pathogen has been studied is usually reflected by its representation in the Herbarium: the needle cast fungus Rhabdocline pseudotsugae, for example, has been studied intensively for many years and is represented by 268 specimens; whereas the trunk rot fungus Fomes igniarius, although it has a wider host range and causes much more damage than Rhabdocline, has received little attention at the laboratory to date and is represented by only 23 specimens.

Approximately one-half of the collections received in the past have been discarded, mainly for the following reasons: representing no new host and distribution records, lack of herbarium space, poor or sparse collections, host or pathogen unidentifiable.

The inventory, in comparison with inventories of previous years, shows a slight decrease in the number of specimens deposited each year and an annual increase in the number of new herbarium records. This tendency can be attributed partly to the improved quality of collections brought in by research personnel and rangers of the Forest Disease Survey (10).

Arrangement of Specimens

The usefulness of a herbarium is limited by the accessibility of its specimens, therefore an appropriate filing system is of fundamental importance. Although designed for forest pathology and forest mycology in particular, the system described conforms basically with standard herbarium practice (2, 3, and 13).

TABLE I

Inventory of Specimens

	Number of specimens	
Taxonomic Section		
Viruses, Bacteria, and Myxomycetes	66	
Fungi	11,347	
Lichens	95	
Mosses	201	
Ferns	147	
Flowering Plants	2,364	
		14,220
Demonstration Section (fungi)		548
Riker Mount Section (fungi)		380
Surplus and Exchange Section (fungi)		3,091
Forest Associations Section (Lichens, Mosses, Ferns, and Flowering Plants)		866
Unidentified specimens		
Fungi	2,112	
Lichens, Mosses, Ferns, and Flowering Plants	330	
Host Symptom	104	
		2,546
Grand total of specimens on hand -		21,651

The Herbarium DAVFP is divided into sections (Table I); each section (except Forest Associations) is divided into major taxonomic groups (Table II); each major taxonomic group is divided into species; and each species is divided into specimens.

Herbarium Sections and the merits of their existence have already been evaluated. The major taxonomic groups of each section are in natural (phylogenetic) sequence (Table II); the species of each group are in alphabetical order of their scientific names, and the specimens of each species are in numerical order of their accession numbers. But the choice of taxonomic groups which serve as divisions in the sections was made according to their significance in forest pathology. Thus families,

orders and even larger taxonomic groups containing few or no organisms of importance to forest pathology were combined into a single group: as, for instance, Viruses, Bacteria and Myxomycetes (Table II), or the Gasteromycetes, a sub-class comprising many orders and families. On the other hand, relatively small taxonomic groups containing many forest pathogens such as Uredinales and Polyporaceae, were retained as separate divisions of Herbarium sections. The reason for "lumping" certain taxonomic groups was to facilitate the access to specimens by simplifying the filing system.

TABLE II

Inventory of Species

Taxonomic group	Number of species	
Viruses, Bacteria, and Myxomycetes	24	
Phycomycetes	11	
Ascomycetes	419	
Ustilaginales	4	
Uredinales	424	
Tremellales	40	
Exobasidiaceae	10	
Thelephoraceae	162	
Clavariaceae	20	
Hydnaceae	55	
Polyporaceae	165	
Boletaceae	16	
Agaricaceae	127	
Gasteromycetes	25	
Fungi Imperfecti	236	
		1,738
Lichens	53	
Mosses	101	
Ferns	48	
Flowering Plants	956	
		1,158
Grand total of species represented -		2,896

A total of 1,008 host species and substrates are affected by the above.

The Forest Associations Section differs in arrangement from the other four Sections in that it is not divided into major taxonomic groups, but into groups representing recognized and described forest associations. Thus each Forest Association is represented by a folder containing the plants typical for the Association. The plants in each folder (Fig. 1e) are in alphabetical order of their scientific names.

A standard classification of plants has unfortunately not been agreed upon. In incompletely known groups, especially fungi, certain species or genera may be described under different families, and certain families found under different orders according to the various text books. For filing purposes in this Herbarium, Gould's "Family names of the plant kingdom" (6), Hitchcock's flora of the Pacific Northwest (7), and Ainsworth's classification of the fungi (1) are followed. For research in botanical nomenclature, the International Code of Botanical Nomenclature (4 and 8) is applied and taxonomic monographs are consulted. In difficult cases the advice of specialists is sought.

Any identified specimen can be readily located in the Herbarium if its scientific name and its major taxonomic group (Table II) are known.

Processing of Collections

Processing involves the selection, preparation, sterilization, identification, recording, acknowledging and filing of plant material. The course a collection may take from the time it is received at the laboratory until it can be deposited as specimen in the Herbarium is shown graphically in the form of a flow sheet (Fig. 7).

All collections received must be accompanied by field data. The minimum of field information required for herbarium purposes is: date and location of collection, name of collector and (for pathogens and saprogens) host species or substrate. A collection without this minimum of collection data is usually discarded.

For survey purposes much more detailed information is required. Field data are recorded on the front of a Sampling Form (Fig. 8). This form is now used by all Canadian Forest Insect and Disease Survey personnel. The back of the form (Fig. 9) is reserved for the signed report of the specialist who will make the identification; it is not to be used for field data. One Sampling Form is thus completed in triplicate for each collection. For agarics, additional information needed is recorded on a separate slip (Fig. 10). For the purpose of Data Processing, nearly all information on the Sampling Form must be coded. Appropriate code numbers are obtained from code lists and maps. Detailed instructions on the use of the Sampling Form are given in a recently prepared manual (5). Ultimately, after all data are recorded on magnetic tape at the central office in Ottawa, all Sampling Forms are filed locally for permanent reference.

Collections are unpacked and sorted immediately on arrival at the laboratory to avoid deterioration by moulds and insects. Some collections are discarded at this time, others are retained for isolation of the pathogens in pure culture and the remainder is placed in the Specimen Dryer (Fig. 5) for sterilization.

Cultures of basidiomycetous fungi are obtained from partly decayed wood: small chips are removed aseptically and placed on malt agar. After growth is established, identifications are made on the basis of cultural characteristics (11). Ascomycetes and Fungi Imperfecti are usually cultured from spores, but tissue- instead of spore-cultures may be made if the fungi are not sporulating. Cultures are maintained on malt agar "slants" (test tubes containing malt agar) and stored in refrigerators at 5 C. The field collections, after cultures have been obtained from them, are placed in the Specimen Dryer together with their Sampling Forms bearing culture numbers and pertinent remarks.

After being dried and sterilized in the Specimen Dryer, the collections are placed on shelves in the Drying Room pending final examination, following which some may be discarded, some may receive their final identification immediately or later on, and some may be mailed to specialists (12) for further examination. Each of the latter is divided into two taxonomically equivalent parts, one to be sent to the specialist and one to be retained in the "Unidentified" file until reported on by the specialist.

At this stage of processing, the Sampling Form is replaced by a permanent Specimen Label or Herbarium Packet (Figs. 11 and 12). Standard data (name of organism, date and location of collection, host of pathogen, names of the collector and the botanist responsible for identification and abbreviated remarks) are transferred from the Sampling Form to the Accession Book (Fig. 13) as well as to the Specimen Label or Herbarium Packet, and the accession number is copied from the Accession Book to the Sampling Form and the Specimen Label (or Herbarium Packet). Only specimens destined for the Taxonomic Section are entered in the Accession Book and given accession numbers.

Foreign specimens and specimens of exceptional taxonomic value have been designated by small, colored tabs attached to the Specimen Labels or Herbarium Packets:

Blue for specimens collected outside of the borders of British Columbia;

Orange for specimens used for or obtained by inoculation; and

Red for type specimens.

In addition to the above entries, the Check List (Fig. 14) and the Host Index (Fig. 15) are brought up-to-date. These are card indices on 3 x 5-inch cards containing up-to-date records of all organisms and their hosts represented by herbarium specimens. The former is a cross-reference of the latter, and vice versa.

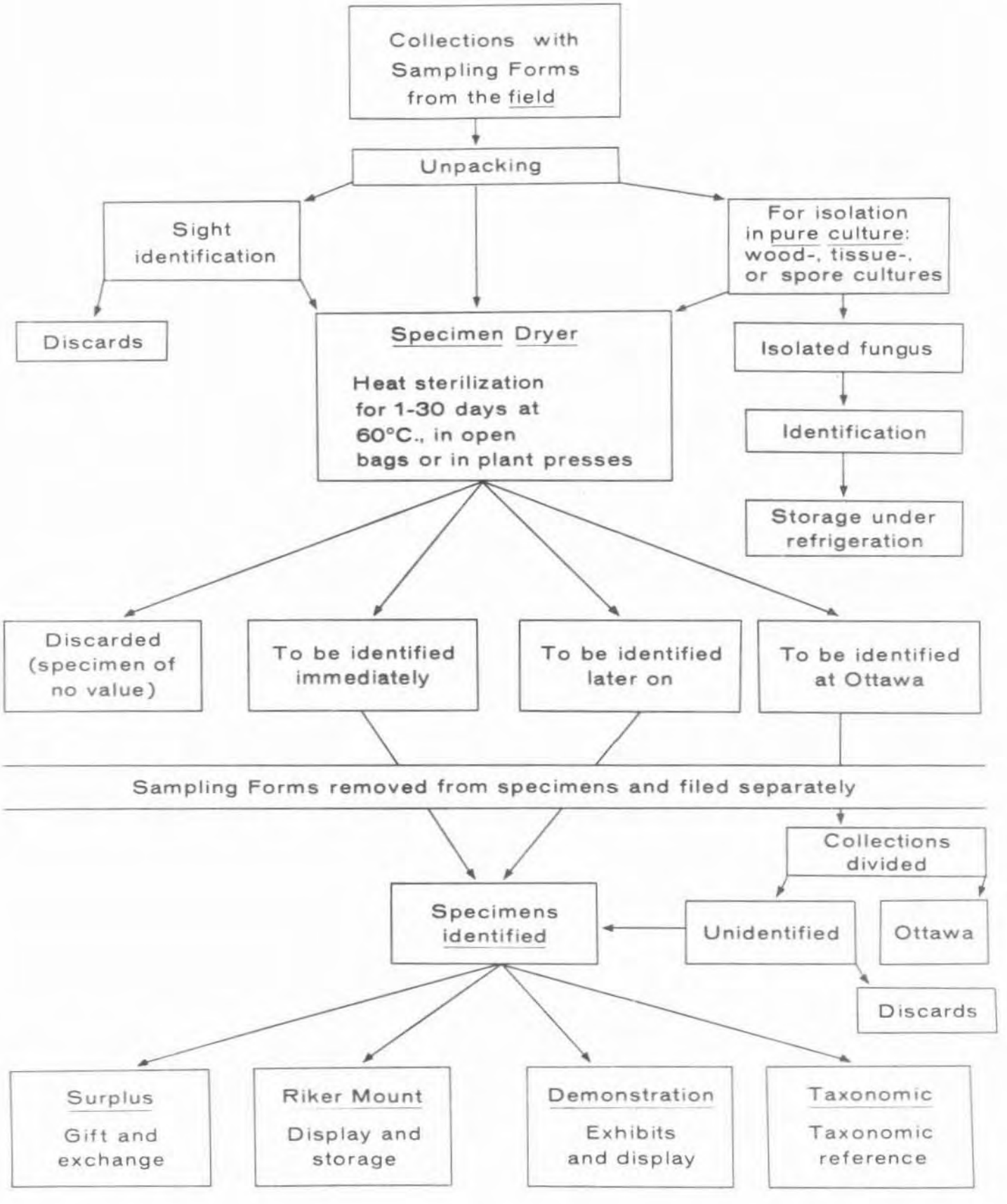


Fig. 7. Processing of Field Collections, flow sheet.

FOREST INSECT & DISEASE SURVEY SAMPLING FORM

1. INSECT (2.) DISEASE

LOCATION

COLLECTION POINT (be specific): West Saanich Rd.

NEAREST POST OFFICE: Victoria

LOCALITY (use Forest Dist. or Div. or Drainage Div. or Political Sub-Div. or FIDS Dist.): S.V.I. — [7] 0 0 1

UTM GRID DESIGNATION [5] 1 0 4 7 5 3 6

PLOT OR SAMPLE AREA NO. [12] 0 0

ELEVATION [14] 0 1

STAND EXAMINED

[16] DESCRIPTION
(1.) Nursery
2. Ornamentals
3. Plantation (Nat. Sp.)
4. Plantation (Exot. Sp.)
5. Shelterbelt
6. Hedgerow
7. Woodlot
8. Natural forest
9. Treed swamp
0. Scattered individuals

[17] HISTORY
1. Undisturbed
2. Clear cut
3. Selective cut
4. Burned
5. Insect damaged
6. Disease damaged
7. Animal damaged
8. Climate damaged
9. Wind damaged
0. Water damaged
(-.) Unknown

[18] ASPECT
1. North
2. Northeast
3. East
4. Southeast
(5.) South
6. Southwest
7. West
8. Northwest
9. Flat

[19] MATURITY
(1.) Seedling (nursery)
2. Transplant (nursery)
3. Seedling (forest)
4. Sapling
5. Young growth
6. Semi-mature
7. Mature
8. Over-mature

[20] ~~AGE STRUCTURE~~
1. Even 2. Two 3. Uneven

[21] ~~BASAL AREA~~ (Circle code of nearest no. of sq. ft.)
1. (33) 2. (66) 3. (99) 4. (132)
5. (165) 6. (198) 7. (221) 8. (254) 9. (287) 0. (320) -. (353) +. (386)

FOREST SECT. [22] 4 0 1

COVER OR SUB-TYPE [25] 0 0 0 0

DOMINANT SPECIES [29] C

[30] ~~HEIGHT OF DOMINANT TREES~~ (Circle code of nearest ht. in ft.)
1. (0.5) 2. (1.5) 3. (3)
4. (7) 5. (15) 6. (30) 7. (45) 8. (70) 9. (100) 0. (140) -. (180) +. (210)

TREES SAMPLED

TREE SPECIES: Prunus laurocerasus — [31] 3 2 0

NO. OF TREES SAMPLED [34] C 1

[36] STATUS
(1.) Living
4. Rec. dead stndg.
5. Rec. dead cut
6. Rec. dead fallen
7. Old dead stndg.
8. Old dead fallen
9. Manufactured

[37] ~~TREE CLASS~~
1. Dominant
2. Codominant
3. Intermediate
4. Suppressed
5. Undergrown regen.
6. Understory tree
7. Fringe
8. Open
9. Old vet.

DATA ON INSECT(S) OR DISEASE(S)

[38] SAMPLING TECHNIQUE

Qualitative	Quantitative
1. Beating	2. Beating
(3.) Hand picked	4. Hand picked
5. Traps	6. Traps
7. Ground observation	8. Ground observ.
9. Aerial observation	0. Aerial observ.
-. Photography	+. Photography

[39] POPULATION LEVEL OR INCIDENCE
1. Negative
2. Trace
3. Low
4. Moderate
5. High
(6.) N.A.

[40] COLLECTION SOURCE
1. Flower
2. Fruit
3. Buds
4. Old foliage
(5.) New foliage
6. New shoot
7. Branch
8. Stem
9. Butt
0. Root
-. Duff or soil
+. N.A.

SAMPLE UNIT NO.

NUMBER OF UNITS [41] 0 0

DAMAGE & HAZARD INDEX [46] 0

COUNT PER UNIT

AV. COUNT [43] 0 0 0

GENERAL

FIDS NO. (See codes on cover) [47] 9 9 0 0 0

LAND OWNERSHIP (See codes on cover) [48] 0

DAY [50] 1 4 MO. [52] 0 9

COLLECTOR: John Tol

ADDRESS: 4649 W. Saanich Rd. (479-4984)

REMARKS & SYMPTOMS

1

0

Fig. 8. Sampling Form, front.

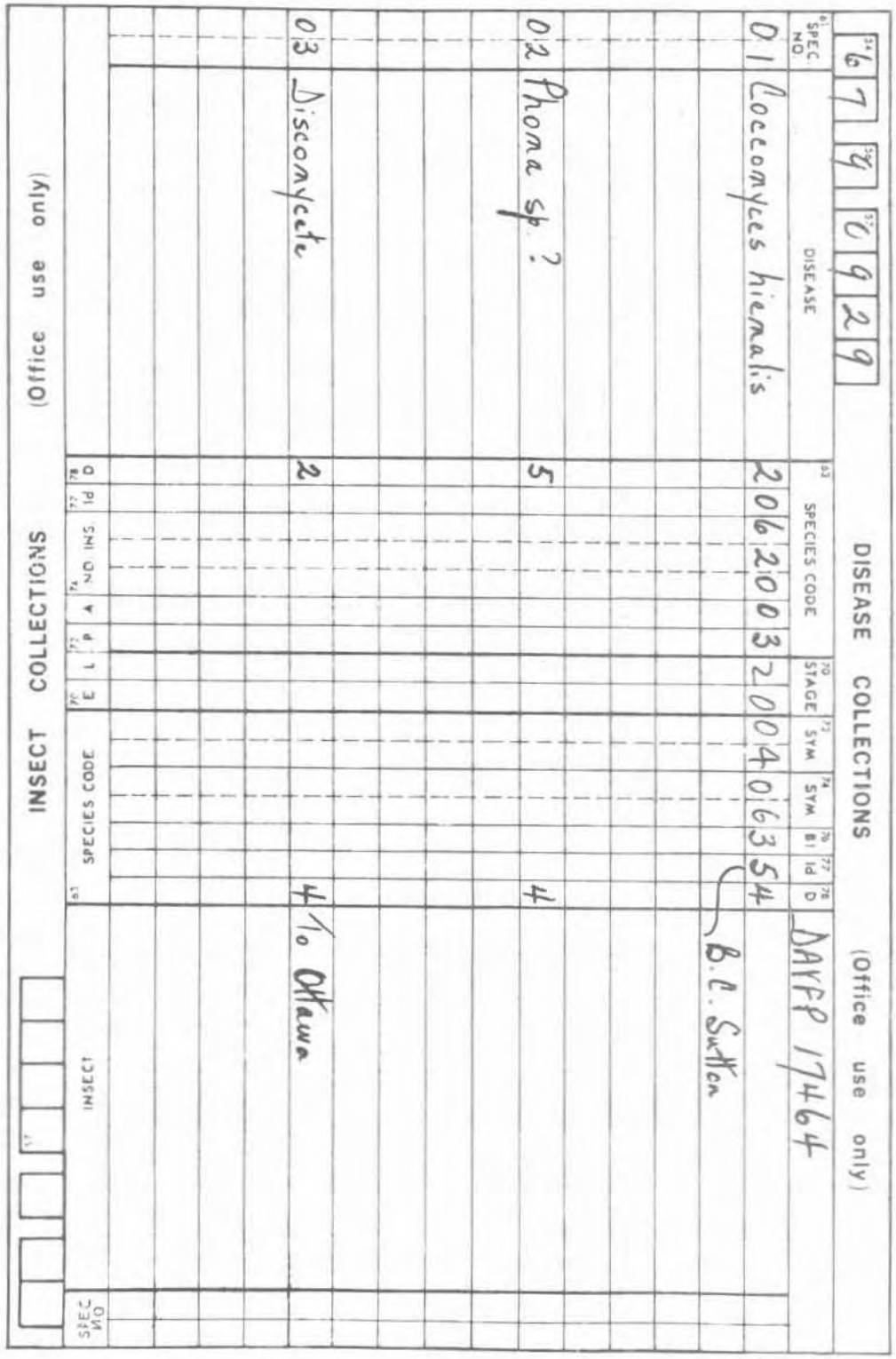


Fig. 9. Sampling Form, back.

Form SF6

No. DAVFP 4381
Name Pholiota destruens (Brond.) Quél.
Locality and Date Cinema, B.C., Aug. 9, 1948.
Habitat on Populus trichocarpa
Collected by G.P. Thomas
Det. by G.P. Thomas

Pileus

Size 5 - 15 cm.
Outline Shape umbonate
Surface Shape sub-circular
Colour light sand colour
Surface rimrose
Margin erose

Context

Consistency fibrous
Thickness 3 mm.
Colour and Changes cream
Odour and Taste mushroom odour, no taste
Juice none

Lamellae

Attachment uncinate
Number about 60
Shape —
Colour dark brown
Veil and Annulus cream

Stipe

Attachment bulbous
Shape cylindrical
Colour sand colour, dark at base
Surface smooth
Substance fibrous
Size 12 - 20 cm.

Volva absent
Spores brown
Related to

Remarks: Causing decay of heartwood of overmature trees.

Fig. 10. Enclosure Slip for Agarics.

DEPARTMENT OF FORESTRY
CANADA
VICTORIA, B.C.

No. DAVFP 13419 DATE: 17 February 1962

Valsa sp.

on Alnus rubra

at Mill Bay, V.I., B.C.

35. Oliphant Lake. No asci or spores present.

COLL. N.E. Alexander DET. A. Funk
F.E.-8

DEPARTMENT OF FORESTRY
CANADA
VICTORIA, B.C.

No. DAVFP 13408 DATE: 11 May 1962

Cronartium (?) comptoniae Arth.

on Pinus radiata

at Great Central, B.C.

35-NVI-P-3. Elsie Lake Rd. XP 74.

COLL. N.E. Alexander DET. W.G. Ziller
F.E.-8

DEPARTMENT OF FORESTRY
CANADA
VICTORIA, B.C.

No. DAVFP 13415 DATE: 22 February 1962

Atropellis pinicola Zeller & Goodding

on Pinus monticola

at Courtenay, V.I., B.C.

2.6 mi. S. of Comox Logging Co. office on rd. to lake. Heavy infection of living branches at nodes. Ascocarps in excellent condition; conidial state also present.

COLL. W.G. Ziller DET. A. Funk
F.E.-8 A. Funk

Fig. 11. Specimen Labels.

(Fold on lines)

FE 193

FOREST PATHOLOGY

DEPT. OF FORESTRY
VICTORIA, BRITISH COLUMBIA

NO. DAVFP 17464 DATE 14 September 1967

01) Coccomyces hiemalis Higgins
02) ? Phoma sp.
03) Discomycete

on Prunus laurocerasus

at Victoria, B.C.

67-9-0929. 4649 West Saanich Rd. See remarks in accession book.

COLL. J. Tol DET. B.C. Sutton

Fig. 12. Herbarium Packet, unfolded.

67-9-0929-01. 4649 West Saanich Rd. Keenan's
be a clear case of cherry shot-hole caused by Cocco-
myces hiemalis Higgins (≡ Higginsia h. (Higgins) Nannfeldt).
On the dead leaves there is a Phoma-like fungus which
I cannot identify. It is not however the spermatial stage
of C. hiemalis. There is also a discomycete on the dead
(contd. on last page →)

67-9-0806. 04-045. Chikamin Bay.
01) Empty asci on 2½year-old needles. Fruiting
severely inhibited by 02. 02) Immature ascospores,
septation obscure, paraphyses uncinate.
Released by W. G.

67-9-0930-01. Kitsilano Beach. II and III.

01) Coccomyces hiemalis Higgins
02) ? Phoma sp. 17464
03) Discomycete
on Prunus laurocerasus
Victoria, B.C.
J. Tol 14:9:67
01)+02) B.C. Sutton

01) (?) Isthmiella quadrispora Ziller 17465
02) Lophoderum autumnale (Darker) Magasi
Abies lasiocarpa
Grassy Plains, B.C.
J. S. Monts, S. J. Allen 19:8:67
W. G. Ziller

Coleosporium campanulae Lev. ex Kickx 17466

Campanula persicifolia
Vancouver, B.C.
H. N. W. Toms 13:9:67
W. G. Ziller

Fig. 13. Accession Book.

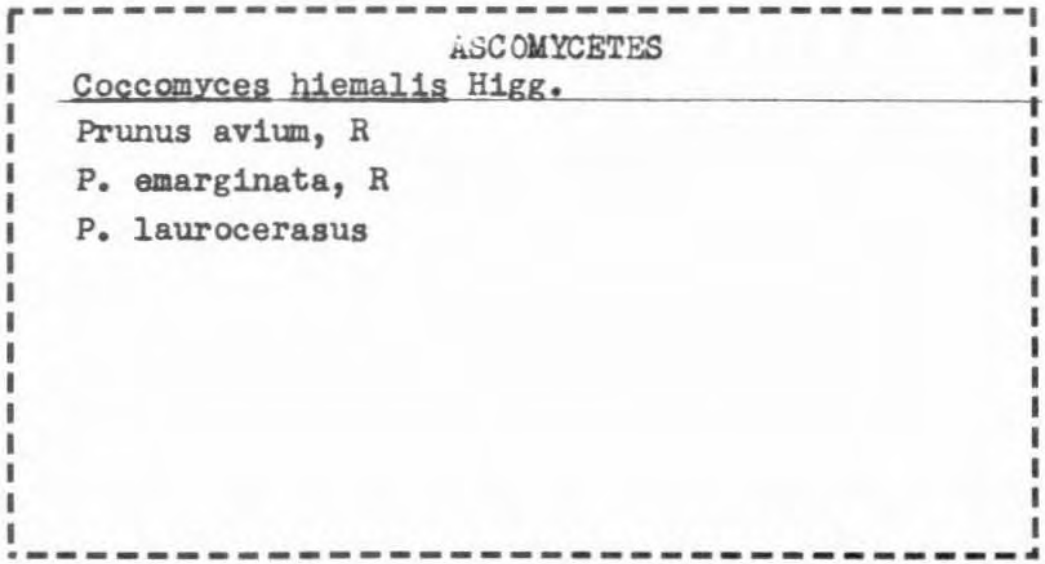


Fig. 14. Index Card from Check List

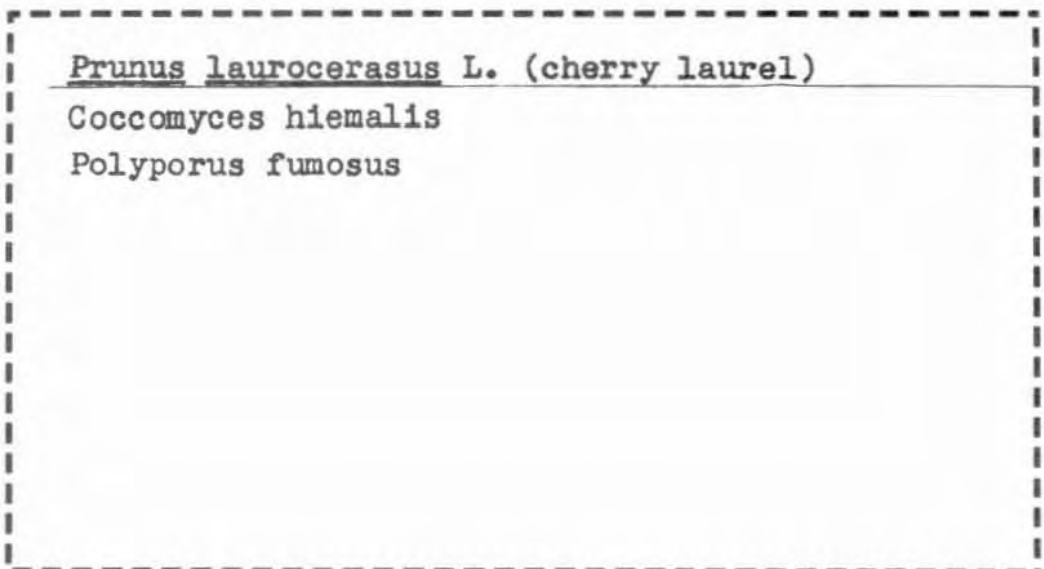


Fig. 15. Index Card from Host Index

The cards of the Check List are in the same order as the specimens in the herbarium: the species of each group in alphabetical order and the groups in phylogenetic order (see "Arrangement of Specimens" and Table II). All cards of the Host Index are filed in alphabetical order of the hosts. This simple alphabetic arrangement of the host cards is preferred particularly by workers, including some mycologists, who are not entirely familiar with botanical classification. In addition to showing organisms and their hosts represented by specimens in the Herbarium, the two card indices contain further information which is signified by code letters after each entry.

No code letter after the entry - represented by herbarium specimen(s) collected in British Columbia;

F - represented by herbarium specimen(s) collected in areas other than British Columbia;

R - not represented by a herbarium specimen, but a published or reliably substantiated record is known and noted on the back of the index card;

C - not represented by a herbarium specimen, but only by pure culture(s);

TYPE - represented by a type specimen.

As soon as an identified specimen has been entered in the Accession Book, previous records in the Check List and Host Index are examined. If they do not show that the host-pathogen combination represented by this specimen is already deposited in the Herbarium, the new host is entered on the appropriate Check List card and the organism on the appropriate Host Index card. The new specimen thus represents a new host-pathogen record in the Herbarium. New records are also noted on the back of the Sampling Form for the collector's information.

Collections in the "Unidentified" file, awaiting identification by specialists, are arranged in numerical order of their accession numbers and their Sampling Forms are filed separately in the same numerical order. As soon as a list of identifications is received from a specialist, the collections are moved from the "Unidentified" file, the identifications are entered on the Specimen Labels, Sampling Forms, Check List and Host Index cards if representing new records, and in the Accession Book. Once identified and recorded as described above, the specimen is deposited in the most appropriate of the five Herbarium sections.

Collections received from collectors other than Survey personnel are acknowledged on standard Acknowledgment Forms (Fig. 16). The information given on these Acknowledgment Forms is self-explanatory. Acknowledgment Forms are typed in triplicate: for the collector, the head of the Forest

Disease Survey, and the curator. They are filed permanently at the end of each field season in alphabetical order of the collector's names. For survey personnel a yellow carbon copy of the Sampling Form serves as acknowledgment.

Exchanges, loans, gifts, and the return of loans are accompanied by a standard form (Fig. 17) to keep a record of specimens mailed to and from the Herbarium. The white form is enclosed with outgoing correspondence and kept by the recipient; a pink duplicate accompanies outgoing shipment of specimens and must be signed and returned by the recipient, and a yellow triplicate is kept on file by the curator. The preparation of the form is self-explanatory.

Collections of non-parasitic Lichens, Mosses, Ferns, and Flowering Plants are not accompanied by standard Sampling Forms. They are not entered in the Accession Book and thus receive no accession numbers. Standard collection and identification data are typed on a gummed Specimen Label (Fig. 11). The label is then glued to the bottom right corner of the Herbarium Sheet on which the specimen is mounted.

Comments and Criticism

Herbarium DAVFP differs from most herbaria mainly in its restricted purpose: an aid to forest pathology. Accordingly, fungi causing the great majority of tree diseases are best represented. Herbarium DAVFP is therefore essentially a mycological herbarium with specialization in forest pathogens.

Since several problems of storage and preservation in a herbarium for forest pathology differ from those encountered in most other herbaria, it follows that equipment and methods should be modified to solve these problems efficiently. For example, curators of many mycological herbaria will, conforming to conventional practice, persist in placing bulky mycological specimens into Herbarium Packets and gluing them to Herbarium Sheets like flowering plants in phanerogamic herbaria. Agarics are pressed, polypores are sectioned and trimmed to fit the dimensions of the packet often at the expense of their taxonomic usefulness. Stiffener cards, used to prevent breakage of fragile foliage in the Herbarium Packets, are not included; even if they were, opening of the Packets glued to the sheets would usually be impossible without damaging the specimens within. From experience in this herbarium, there seems to be no advantage in mounting packets on Herbarium Sheets--only the disadvantages of extra labor in processing, difficulty in handling the specimens, reduced accessibility and increased breakage. The advantages and disadvantages of "specimens in packets attached to herbarium sheets" and "specimens filed vertically in packets or envelopes" have been evaluated in much more detail by Bartholomew (3). At this herbarium, the use of Specimen Boxes for bulky material and the filing of Herbarium Packets vertically like cards in a card index have resulted in increased accessibility and reduced damage to the specimens.

CANADA

DEPARTMENT OF FORESTRY

FOREST ENTOMOLOGY AND PATHOLOGY BRANCH
FOREST INSECT AND DISEASE SURVEY

ACKNOWLEDGEMENT

Mr. John Tol,
4649 West Saanich Rd.,
VICTORIA, B.C.

Forest Research Laboratory,
506 West Burnside Rd.,
Victoria, B.C.,
October 6, 1967.

Dear Sir:

We wish to acknowledge receipt of the following collections:

COLLECTION NO. FIELD	COLLECTION NO. LAB.	HOST	INSECT OR DISEASE*	STATUS (SEE BELOW)
1967 14:9:	DAVFP 17464 (0929)	Prunus laurocerasus	01) Coccomyces hiemalis	-
			02) ? Phoma sp.	-
			03) Discomycete	-
			See copy of letter enclosed.	

*REMARKS ON REVERSE SIDE

STATUS OF INSECTS OR DISEASES

A – Known to be causing serious damage.
B – Capable of causing damage.
C – Not known to cause damage to healthy trees.
D – Under observation. We would like more information & material.
E – Useful or beneficial organism.

Your co-operation with the Forest Insect and Disease Survey is of great value and is much appreciated.

Yours very truly,

W. G. Ziller
for Survey Head.

Fig. 16. Acknowledgment Form.

FOREST RESEARCH LABORATORY

DEPARTMENT OF FORESTRY OF CANADA

VICTORIA, B.C., CANADA

TO: **Dr. R.A. Shoemaker,**
Plant Research Institute,
Research Branch,
Canada Dept. of Agriculture, Central Experimental Farm, Ottawa.

September 19, 1967.
(Date)

The specimens mentioned below are being forwarded to you by ...**parcel post**.....

in .....**one**.....package(s) as: ☐ EXCHANGE ☒ GIFT

☐ LOAN* ☐ RETURN OF LOAN

* Specimens on loan should be returned .....

Description of Specimens:

DAVFP 17463 on Juniperus sabina

DAVFP 17464 on Prunus laurocerasus

Notes:

These have been submitted by a local tree nursery. They would like to know the cause of the disease and how to control it.

W. G. Ziller
.....
(Curator, Mycological Herbarium)

PLEASE SIGN AND RETURN THE COLOURED FORM.

Specimens received in good order: 25 Sept 67
(Date)

R. A. Shoemaker
(Signature)

Correspondence and specimens should be addressed to: Curator,
Mycological Herbarium,
Forest Research Laboratory,
506 West Burnside Road,
Victoria, B.C., Canada

VIC. #24

Attention: **Dr. Wolf G. Ziller**

Fig. 17. Exchange, Loan, Gift, and Return of Loan Form.

Herbarium space is always at a premium: a choice needs to be made among

(a) crowding with resultant damage and reduced accessibility;
(b) trimming the specimens resulting in impaired quality; or
(c) increased expenditures for cabinets and their housing.

The inexpensive wooden cabinets in use are unsatisfactory for reasons stated. If the cabinets are not airtight, ventilation of the herbarium is necessary to carry away the naphthalene fumes. Up-to-date botanical (mycological) reference books, equipment for microscopic examination and a large, well-illuminated table, preferably under a window, are essentials for every herbarium.

The advantages of special equipment and methods such as the Display Cabinet for Riker Mounts, the Specimen Dryer, and the division of the Herbarium into sections have already been pointed out. Still, much is left to be desired and considered for the establishment of a new herbarium for forest pathology.

Acknowledgments

The organization of the Herbarium, its development, and the quality and quantity of its identified specimens are largely attributable to continuous assistance from the Mycology Section, Plant Research Institute, Research Branch, Canada Department of Agriculture. Approximately 10 to 15 per cent of the collections are identified by specialists of this Section each year. Dr. Ruth Macrae's advice on herbarium procedure was particularly helpful. Many other mycologists, renowned in their fields of specialization, such as Profs. L. O. Overholts (Polyporaceae), H. S. Jackson (Thelephoraceae), and J. L. Lowe (Polyporaceae), have made invaluable contributions by their identification of collections.

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