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[Should be available from most good stationary shops]

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Collections Research

**ARE LOW TEMPERATURE
PEST DISINFESTATION
PROCEDURES 'SAFE'?**

At the September, 1999, meeting of the UK Systematics Forum Insect Collection Managers Group, George McGavin of the University Museum, Oxford, expressed misgivings regarding entomological drawers subjected to freeze-thaw cycles. This related particularly to deterioration of adhesives and changes in the fit of drawer lids. The Group also noted growing interest in the use of carbon dioxide fumigation as an alternative to freezing. As we in The Natural History Museum have come down firmly in favour of freezing as our preferred routine option for eradication of pests in our collections, such

reported problems caused us particular concern. In addition, while carbon dioxide fumigation is certainly a valuable tool in our armoury it does have clear disadvantages over low temperature eradication – the need for specialist equipment and operators, the three-week fumigation period, and health & safety implications come immediately to mind.

In an attempt to demonstrate justification for these misgivings, we subjected four different models of our standard insect accession drawers to seven successive freeze-thaw cycles. In accordance with established procedures the drawers were bagged in a standard 'black bin-liner' and then tightly sealed. The duration of each freeze phase varied between three and five days, with a minimum of one day at room temperature between each 'freeze'. This would mirror seven repeats of the usual freezing cycle – 3 days at minus 30C, then 24 hours at room temperature before the integrity of the seal is broken. At the end of the exercise we could not detect any structural deterioration in our test drawers – the joints were still firm, the lids close-fitting and any linings were still securely attached.

The drawers that we tested were of various vintages and styles – the oldest was a cardboard 'French Style' moth carton; the others were all wooden – a hard wood drawer from the 1960s and its 1980s intake equivalent, and one of our current accession drawers as manufactured by Stephenson Blake & Co., who kindly provided us with the specifications of the adhesive used in construction, Evo-Stik 9517TM. This is a water-resistant polyvinyl acetate emulsion that includes amongst its features "freeze/thaw cycling does not break the emulsion". However, our discussions with the adhesive manufacturers suggested that this practice could not be repeated without the risk of damaging the bond.

While the potential for such problems might relate to special properties of adhesives, there are perhaps two other possible contributory factors. The Group's minutes also note that "poor control of freezing procedures could also result in mould growth if drawers are opened while still cold". Obviously, drawers should not be opened while still cold – there should not even be the opportunity to open them since they should be in containing plastic bags that ought to remain firmly sealed until the drawers have returned to room temperature!

During freezing, as air temperature drops, then the water-carrying capacity of air decreases and the relative humidity of the air increases. At, or below freezing point, air can no longer carry free water which is frozen out. When the temperature starts to rise back to ambient, the opposite changes occur. With a large volume of free air this could cause water loss and consequent physical changes in an object (which for an entomological collection would include

the insect drawer). Damage can be further compounded by water in the air condensing on the outside of a cold object when it is removed from a freezer.

The objective of bagging then is to enclose an object in a minimal air space so that air soon reaches an equilibrium and any movement of water to or from an object is extremely small. Bagging also provides a physical barrier between any condensation and the object (in our case the insect drawer). Freezing of objects with a large buffering capacity such as animal skins or textiles is extremely safe as they will produce a very rapid equilibrium in a small bagged air space. Treatment of large, hollow non-absorbent objects needs more careful management, if possible by the use of extra buffering material such as acid-free paper or cotton wadding that would ensure that objects experience little change. Conventional insect drawers, either with a solid base or slatted, contain sufficient buffering capacity to allow for rapid equilibrium. However, specialised Lepidoptera drawers, glazed both top and bottom, might potentially present more difficulties. But whatever the material, following freezing, objects should never be removed from their bags until they have reached ambient room temperature.

The second point relates to characteristics of adhesives at low temperatures, particularly with respect to high vibration levels that could be experienced by an object held in a poorly maintained freezer. It seems quite likely that at the low temperatures routinely reached during disinfestation (minus 30C) significant vibration could have a detrimental effect upon adhesion, perhaps causing actual breakage of the bonding and significant damage to specimens themselves. Using a Tinytag PlusTM shock logger, we tested all three freezers currently used in Entomology for both vertical and horizontal components of vibration. In all cases movement was minimal – in some instances we could detect the cutting-in and out of the motor and also some shock when the freezer door was opened and closed. However, these readings, obtained by attaching the loggers to the outside 'skin' of the freezer with Velcro, might not represent the true vibration of the shelves inside (the loggers would not withstand freezing). If shelf vibration was indeed a concern it could be reduced by using low-temperature tolerant cushioning (say Plastozone) between the shelf and object.

Our re-assessment of freezing for disinfestation has not led to any changes in our own adopted standard protocols. But any institutions that have set in place a rolling programme of preventative freezing on say an annual basis should carefully monitor for deterioration in adhesives whether used as mountants or in the construction of either objects themselves or

collection containers. But even if low-temperature treatment is only employed 'reactively', it should be supported by accurate documentation so that future conservators can associate any deterioration of adhesives with previous actions.

In conclusion, it is perhaps useful to re-state the basic protocol that we use with respect to insect drawers. Upon finding an infestation it should be a matter of routine that all adjacent drawers are searched. For a cabinet-wide infestation, all drawers would need to be removed and the cabinet itself vacuum-cleaned and perhaps lightly sprayed with insecticide (Constrain, a permethrin-based microemulsion is ideal, particularly developed for the museum environment). Then:-

- Infested drawers should be isolated in tightly-fitting plastic bags that are securely sealed.
- Bagged drawers placed in freezer for 72 hours at minus 30 degrees centigrade.
- Bagged drawers removed from freezer and stored at room temperature for 24 hours before seal is broken.
- Only after thawing are drawers opened and necessary remedial work undertaken.
- Keep permanent record of all actions.
- Continue to monitor the area of infestation, both visually and by means of monitoring traps.

Suppliers: Tinytag Plus™ - Meaco, Unit 8, Smithbrook Gdns, Cranleigh, Surrey, UK.

Evo-Stick™ - Evode Ltd, Common Road, Stafford, UK.

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Books



BOOK REVIEW

"Identifying British Insects and Arachnids - An annotated bibliography of key works", edited by Peter C. Barnard, Cambridge University Press with the Natural History Museum, 1999, ISBN 0-521-63241-2, Hardback, price £50

This is a welcome addition to the field which has been dominated previously by the various editions of Kerrich, Hawksworth and Sims 'Key Works to the Fauna and Flora of the British Isles and North-western Europe. Operating over a narrower taxonomic range than its predecessors and with double the paper, the scope for discussion and annotation is dramatically increased.

The book has a pleasing appearance, is well bound and appears to be well proofed against the ravages of a wet workbench. The introduction sets out its purpose; to ease the laborious process of getting to grips with the scattered works which are needed for the identification of any one group of British insects or arachnids. It is 'largely intended for the reader who is moving on from basic texts to more specialised ones'. Entomological journals, societies and general references are listed in this introduction.

There follows a useful chapter on 'Sources of Information' by Julie MV Harvey, enumerating the various ways in which references can be sought out and covering the full range from ink on parchment to web site. A section on understanding bibliographic references contains useful notes on sources of confusion and a guide to journal abbreviations. The pages dealing with entomological libraries are useful, although the shortest section deals with local museums thus - "Some local museums with natural history collections have developed small reference libraries, which may be available to the public" (Quoted in full). My own local museum library is used extensively by members of the public and I am sure that similar arrangements are offered by many of my BCG colleagues. Such a brief statement seems almost to dismiss the pivotal role played by local museums, with collections and expertise, in weaning and giving direction to budding entomologists as they begin to specialise. The remainder of the chapters is taken up with creating personal entomological library.

The meat of the book then appears; 323 pages with chapters on each insect order (23,500+ species) and the major arachnid orders (2420 species). Each chapter introduces an order and ends with a well annotated bibliography highlighting the most pertinent works. The orders are dealt with by individual specialists and, in addition to his own groups, the chief editor seems to have acted as 'sweeper' to deal with any 'orphaned' groups.

The treatment of each order seems to be weighted differently. For instance, the Dipper (6643 species) are allotted just over 20 pages whilst the (admittedly complex) Hymenoptera (7000+ species) have more than 120 pages dedicated to them. It is pleasing to see in the Coleoptera section, mention of clubs, societies, newsletters and recording schemes. For anyone 'moving on from the basic texts', these schemes are as essential as the literature in informing 'part time'