Narcotising Sea Anemones

S.J, Moore
Hampshire County Council Museums Service, Chilcomb House,
Chilcomb Lane, Bar End, Winchester SO23 8RD

Standard techniques have been reviewed and modified to improve methods for narcotising actiniarians. Experiments have been carried out on the more common species of intertidal and shallow water British sea anemones. A notable increase in the usual success rate has been achieved.

INTRODUCTION

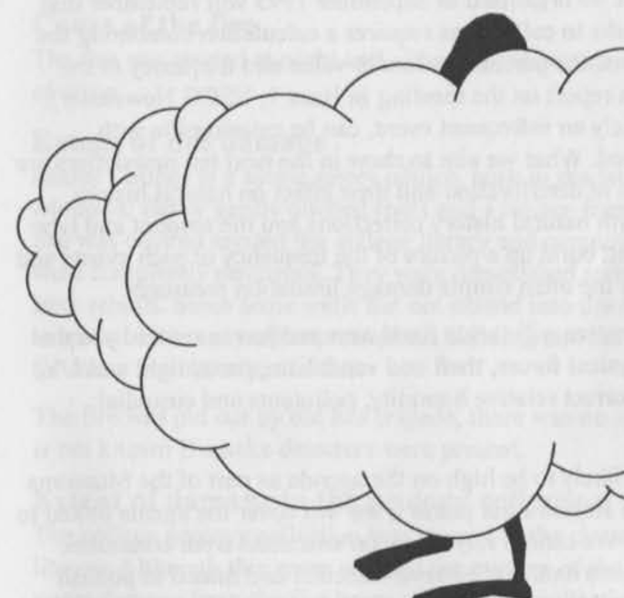
Many techniques have been devised to overcome certain problems encountered when narcotising actiniarians. From these a few have been selected as being at least partly successful. Further modifications to these narcotising methods have been introduced in order to block more effectively the nervous pathways responsible for secondary contraction reactions. Until now, perfectly expanded specimens have been achieved largely by chance. This paper records experimental results and arising problems as a contribution to a better understanding of the process and a more consistent rate of success.

NATURE OF PROBLEMS

1. Keeping an anemone in a medium so that it will not close during the induction period - until it no longer responds to food or tactile stimuli (primary narcotisation stage or PNS). Successful PNS can be achieved by studying the circadian rhythms of the anemones related to water movement for intertidal species and by introducing artificial conditions which stimulate the anemone to remain open; these are cool environment, water movement and presence of food.
   A. Cool environment - container kept in constant-temperature room at 4-10°C.
   B. Water current - to stimulate tidal motion; maintained by magnetic stirrer set between 350 and 500 rpm in 2-5 litres of seawater. This also effected an even mixture of the narcotic.
   C. Feeding with small amounts of food not only encouraged the anemone to stay open but was also necessary in assessing stages of narcotisation as response to food fell off.
2. Having successfully reached PNS, the secondary nervous pathways had to be blocked since the anemone was still responsive to chemical stimuli. Further chemical induction could lead to a gradual closure either by rapid detection of a less tolerable environment or, at a more advanced stage, by the anemone becoming 'accommodated' to the narcotic. According to Shelton *et al*. (1982,

The Ten Agents of Deterioration

An issue by issue guide to the risks facing museum collections



1. Fire

The Ten Agents of Deterioration - Forthcoming themes for the Natural Sciences Conservation Group Newsletter.

Your committee decided recently to apply a theme to our newsletter of the ten agents of deterioration and to address one risk per issue, starting with perhaps the most commonly thought-of risk to collections, that of fire.

Those of you who attended the Canadian Museum of Nature's Conservation Risk Assessment workshop that we organised in September 1995 will remember that the process of assessing risks to collections requires a calculation combining the likely damage to collections, the percentage loss in value and frequency of the event. (See David Carter's report on the meeting in issue 1, NSCG Newsletter). Thus fire, though fortunately an infrequent event, can be catastrophic with collections largely destroyed. What we aim to show in the next ten newsletters are examples of the ten agents of deterioration and their effect on natural history collections or museums with natural history collections and the amount and type of damage caused. This will build up a picture of the frequency of such events and should help us to establish the often simple damage limitation measures.

This issue is devoted to fire, we will tackle flood next and just to remind you the other eight agents are: physical forces, theft and vandalism, pests, light and UV, incorrect temperature, incorrect relative humidity, pollutants and custodial neglect.

Since disaster planning is likely to be high on the agenda as part of the Museums and Galleries Commission Registration phase I, we will cover the agents linked to this type of planning first. We cannot rely solely on anecdotes from committee members - we need your contributions, however succinct and intend to publish supplementary sections should you miss out on the relevant issue.

Kate Andrew

Case Study - Fire at Eccles College

Kate Andrew, Ludlow Museum, Old Street, Ludlow, SY8 1NW

Eccles College, a sixth form college in Greater Manchester suffered severe structural and smoke damage from a fire in the building in May 1993. The insurance company loss adjuster and the college approached me shortly afterwards to assess the value, level of damage and the cost for recovery of the college geological collection. Following an initial one day visit, I prepared a report on the damage to the geology collection and several options in a fully-costed recovery programme, one of which was commissioned. The insurance company paid for the conservation work.

Cause of the fire

The fire was started at night and although not proven, was thought to be the result of arson.

Extent of fire damage

Eccles College is a single storey edifice, built in the late 1960s with large windows, flat or gently pitched roofs and a timber-framed panel construction. The fire was centred around the college library and computer room and these areas were completely destroyed. They were demolished soon after my initial visit and later rebuilt. Since some walls did not extend into the roof voids smoke was able to spread into many other parts of the building and the smell of smoke lingered for many months after the fire.

The fire was put out by the fire brigade, there was no sprinkler system in place, it is not known if smoke detectors were present.

Extent of damage to the geology collection.

The college geology collection was housed in the classroom adjacent to the library. Although this room escaped the ravages of the flames and subsequent water damage from the fire hoses, parts of the collection were badly smoke damaged. The smoke appears to have condensed onto the specimens forming a matt, opaque and rather sticky layer. It is presumed that the large amount of plastics in the fire, for example library book covers, contributed to the large amount of carbon in the soot.

Relationship between soot damage and type of container

Specimens on open display were coated in a uniform matt black layer, totally obscuring detail, it was difficult to identify many of these specimens until they were cleaned. The specimens remained stained with a pale sepia colour.

Specimens that had not been put away were matt black on upper layers, cleaner below. Handling material, heaped into trays and containers, showed both clean areas where they were covered by other specimens but were totally black where the surface was exposed.

Specimens in wooden drawers and shallow metal drawered office stationery units suffered a gradation of damage; soot accumulation at the fronts of upper and poorly fitting drawers was as bad as that found on specimens left out in the open; damage in better fitting drawers was less. Smoke damage graded noticeably from front to back with only minor damage at the rear. Damage was similar in both metal and wooden drawers.

Specimens in sliding plastic drawer-trays in cupboard units with doors seemed to be largely unaffected although the exteriors of the units were so thickly coated in soot that they were beyond salvage.

Specimens in boxes with flat lids - e.g. cigar boxes and microscope slide boxes showed a minor amount of smoke creep under the lids.

Specimens inside boxes with full length lids were completely unaffected by smoke even though the boxes were completely blackened and these were discarded.

Soot Removal

The soot proved insoluble in the normal range of cleaning solvents and solutions applied by swab and so enquiries were made to determine what cleaning methods had been used to remove soot from similar objects.

The papers about the fire at the Saskatchewan Museum of Natural History (Spafford, Graham and Pingert, 1991) deal with soot accumulation and refer to cleaning of most kinds of natural history specimen but not geological specimens. A commercially available sponge used in fire clean-up operations such as cleaning walls prior to repainting, vacuuming, dry brushing and dry-cleaning with glass beads had even been used on taxidermy specimens.

A fire in an archaeological small finds store, where Stewart Plastic storage boxes had melted and burned, depositing thick black soot on pottery shards, proved the most useful comparison. Clean up from this event led to specimens being scrubbed with old toothbrushes and detergent.

Historically, carbon-tetrachloride was used to remove carbon deposits, however, its highly carcinogenic nature and COSHH regulations precluded its use for this task. After extensive trials with a combination of the commonly-used cleaning solvents, a cleaning method was devised of scrubbing specimens in a mix of de-ionised water and Symperonic N anionic detergent, followed by rinsing in clean de-ionised water and drying on paper towelling. Where specimens were sufficiently robust and soot accumulation was thickest, the toothbrush was dipped

into a paste made of Symperonic N and 40 micron airbrasive glass beads in de-ionised water, the beads providing additional scouring. Even with repeated scrubbing, porous specimens retained a sepia coloured tint on soot covered areas.

Though far from ideal, for a collection of some 2,000 items, this proved to be by far the quickest and easiest cleaning method. Draining on several changes of paper towelling promoted rapid drying and reduced the risk of relative humidity related damage. Specimens with pyrite decay were cleaned using an airbrasive machine and glass beads before being treated with the experimental ammonia method (Waller, 1987).

The paper specimen labels proved harder to clean. Draft-clean powdered eraser was partially successful, a very dilute ammonia solution (1-2%) proved effective on the glossy paper surface on a souvenir box of volcanic rock samples from Mount Teide.

Conclusion

Lidded containers provided the best means of defence against smoke damage and since these were relatively low cost, were simply replaced. Closed cupboard doors also provided an effective smoke barrier but free standing drawer units especially those with loosely fitting drawers proved to be an ineffective barrier. Specimen details on the outside of boxes and drawers were obliterated by soot, specimens inside boxes could only be fully identified if a second label was inside the box. No catalogue could be found for this collection; if a catalogue had been present, data retrieval would have been possible from specimen accession numbers. In the event, complete re-identification and re-curation was undertaken.

Although the compartmentalisation of the building into rooms combined with the rapid response of the fire brigade, which prevented the spread of this fire, a sprinkler system would have extinguished it at a far earlier stage and reduced the amount of time required for the conservation cleanup and collection recovery project.

Drawered units without doors proved an ineffective barrier against smoke.

References

Andrews, K.J. 1997 Documentation day in the life of...MDA Outlook, Winter 1996/1997, p 6

Spafford, S., Graham, F. and Pingert, D. 1991 Fire recovery at the Saskatchewan Museum of Natural History: Description of events and organization recovery and testing and cleanup. Abstracts of the 17th Annual IIC-CG Conference, 24-26 May 1991, Vancouver pp 18-19

Conservation News

Waller, R.R. 1987 An experimental ammonia gas treatment method for oxidizing pyritic mineral specimens. Pre-prints of 8th triennial meeting of ICOM Committee for Conservation, working group 13, Natural History Collections. Sydney, 1987. pp 625-630

A tale of effective smoke detectors

Kate Andrew, Ludlow Museum

Whilst carrying out a geology collection survey at Bolton Museum and Art Gallery, I experienced a minor fire at first hand. The fire alarm sounded at about 12 midday. The building, which includes an aquarium and public library as well as the museum and art gallery, was quickly and efficiently evacuated and staff and visitors gathered outside on the other side of the road.

The fire brigade arrived within a matter of minutes and entered the building, the fire detection system indicated the source of the alarm to be one of the public toilets. A fire in a toilet paper dispenser was rapidly put out, the building checked over and after about forty five minutes from the alarm sounding, the building was open to the public again.

As with the Eccles College fire, the cause was apparently arson, but an effective fire detection system and an automatic fire alarm brought a rapid response with only minor damage.

Fire at National Museum of Natural History, Paris

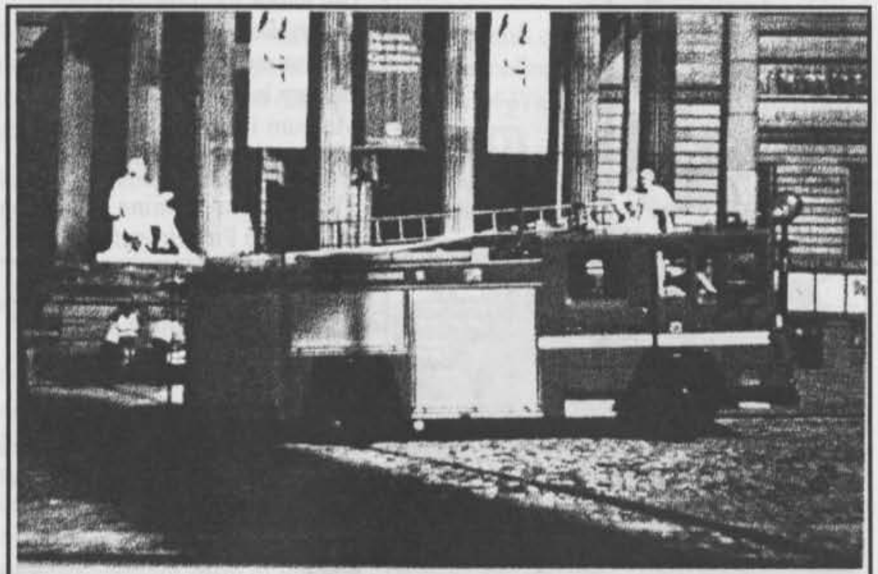
BCG nearly didn't see the star attraction of the 1996 trip to Paris.
Declan Butler writing in *Nature* (30th January 1997, #378) reports that a serious fire at the National Museum of Natural History in Paris in August 1996 got within metres of the world's largest herbarium, some 8 million specimens. Decades of neglect have allowed the buildings to fall into a dangerous state of decay with many areas of the museum failing to meet minimum safety requirements, antiquated electrical systems, dangerous roofs and poorly stored chemicals. A major report by the CNE, an independent advisory committee to the French Government, has led to the government agreeing to carry out a detailed audit of museum improvement requirements before the summer of 1997.

Fire Procedures at National Museums and Galleries on Merseyside

Sally-Ann Yates, National Museums and Galleries on Merseyide

The Conservation Centre of the National Museums and Galleries on Merseyside was developed to support NMGM's seven venues in and around Liverpool. The rich and varied collections held by the Walker and Lady Lever Art Galleries, Sudley House, Liverpool Museum, Merseyside Maritime Museum incorporating HM Customs and Excise Museum and Museum of Liverpool Life draw an average of 1.3 million visits a year.

With so many buildings and collections to consider - everything from full-sized ships through to natural history collections - emergency preparedness is the top priority. Conservation staff operating from the new centre have concentrated on protection and salvage of objects from the new centre. The commonly used words 'emergency' and 'disaster' cover a wide range of events. From a small water leak to a major fire, physical damage or even total destruction may be the fate of any objects in the vicinity.



Fire exercise at Walker Art Gallery, July 1995. PAP 3977

Planning throughout NMGM has taken many forms, both practical and theoretical, examining many aspects of risk management. This is viewed as a long term activity with all plans and resources being regularly reviewed and updated.

For staff evacuation and organisation during an emergency, the Personnel Department has prepared a 'Major Incident Plan'. Further to this, examples of action taken by Conservation in order to care for the collections themselves include:

- Purchase of equipment, materials and protective clothing for emergency use only
- Formulation of basic training in emergency object handling for all staff
- Provision for key personnel to be contacted on a 24 hour basis
- Planning roles for key personnel during an emergency
- Sourcing back up resources, for instance transport and freezer companies
- Liaison with the Merseyside Fire Brigade

Framed art nouveau poster designated for moving by Fire Brigade. PAP 4029

Contact with the Merseyside Fire Brigade has been rewarding with two major training exercises undertaken to date, the first concentrating on the Walker Art Gallery in 1995, then the Liverpool Museum in 1996 and this year the Merseyside Fire Brigade.

The aim is to examine the response of both the Fire Brigade and our own staff if a fire, smoke or the means of extinguishing (i.e. water), were to endanger the collection material.

Although the Fire Brigade's primary objective is to save life and put out the fire, they also consider damage limitation as a high priority, and NMGM is very grateful to them for their assistance with the project.

The exercises follow a series of training sessions given by the NMGM staff for the Fire Brigade crews. These give basic information on the types of object held in the building and how they are stored and displayed. Information is also given on their vulnerability along with basic guidelines for protection and handling if the objects are thought to be in serious danger.

For the exercises themselves (held on Sunday mornings to avoid disturbance to the public) we decide where the fire(s) are to be and position pretend objects nearby. The alarm is raised and the Fire Brigade utilise their crews to find the fire, fight it and also protect or remove objects in immediate danger. Each exercise is followed by a debriefing.

We can thereby evaluate the effectiveness of our training and raise the awareness and knowledge of all involved as to what problems might be encountered in a real situation. It is also an important means of examining our own emergency planning procedures and identifying the gaps in such areas as communication and use of resources for salvage activities.

Fire and Wet Collections in Alcohol

Fire officers can get very worried at large volumes of alcohol. However, Velson Horie and Rob Waller reported seeing the wet collection at a museum in Dresden that had been fire bombed during the 2nd World War, some specimens were gently cooked but still wet.

Has anyone else anything to add to this topic?

Fire at Bewdley Museum Stores

Bewdley Museum store is referred to in Bordass (1996) as an example of an unheated store in a fairly new block of industrial units with an air-conditioned plaster board container kept at 16°C and de-humidified if necessary. Large scale industrial, agricultural, household and building items are housed in the main part of the store with sensitive items in the inner container which is made of insulated timber studwork and plasterboard. The door to this inner container is fitted with brush dust seals.

In early 1995, as a result of a paint spray explosion, a serious fire broke out in the adjacent unit that was being used at the time to make flock wallpaper. Within about thirty minutes, this unit was completely gutted and the metal roof girders reduced to twisted remains. Fortunately the block work and plasterboard party wall contained the fire long enough for it to be put out by the fire brigade, although it was close to collapse and a few blocks were dislodged, showering the unit with dust.

Items in the main area suffered severe smoke damage but the flames did not spread into the museum's unit. Material inside the plasterboard container was completely unaffected by either the fire or the smoke, although had the fire been in the unit against which the box was constructed, this might have been a different story.

The rebuilt unit is currently used by another company for storage, but as Bordass says 'this experience draws attention to some of the hazards of neighbours on industrial sites which need to be considered very carefully when selecting appropriate buildings'.

Information supplied by Carol Bowsher, Museum Officer, Bewdley Museum and from the following reference:

Bordass, B. 'Museum Collections in Industrial Buildings - a selection and adaptation guide' ed. Cassar, M., Museum and Galleries Commission, 1996

Fire at Maidstone Museum - June 1977

An arsonist started a fire in the west wing of Maidstone Museum, a listed historic building one Saturday lunch time in June 1977 using cotton wool soaked in white spirit. The fire was started on a staircase and the chimney effect drew flames up into the attics in which natural history offices were located and collections, mainly taxidermy and entomology were stored. The staircase wall was shared with the Kent Archaeological Society Room, and books on shelves backing onto the wall suffered spilt bindings and damaged leaves from the heat. The fire also burned into a gallery on a lower floor, much of the building suffered smoke damage and water damage was severe in the rooms adjoining the site of the fire, but the fire was contained within the west wing.

Since the museum was open to the public at the time the fire was started, the fire brigade were called quickly. A large number of fire engines attended the fire by which time, smoke was pouring out of the Natural History attic windows. The Museum Attendants cleared the building of visitors calmly and efficiently, some curatorial staff were already on site, others were called in by telephone. Once the site of the fire was located, although it looked for a while as if the flames would

win, the firemen plied the effected area of the building with hoses and the fire was extinguished. Staff were later allowed in to salvage what they could.

The amount of water used to extinguish the fire in turn caused flooding in the ground floor area beneath the site of the fire (almost deep enough to swim in at points) this then drained into the cellars. Fortunately archaeological collections in the cellars were stored on shelves so were higher than the several inches of water that accumulated, however some costume collections were damaged.

Lack of a disaster plan meant that emergency salvage was done instinctively with little organisation, with all available staff doing the best they could using common sense. Charred, waterlogged and singed specimens and cased objects were moved out of the danger area, water was poured out of glass-topped insect drawers.

After the fire, damage was assessed and staff continued to help with the salvage operation. Smoke had damaged 18th century portraits (fortunately glazed), furnishings and carpets in galleries adjacent to the fire were water logged, a large oriental carpet had to be written off after attempts to dry and clean it failed. Drawers from storage cabinets containing natural history collections were removed from the attic, examined for potential salvage and then either disposed of or kept. Although the exterior of many of the 19th century cases were charred, the varnish had been melted by the heat of the fire and had formed an effective seal against smoke and water, many parts of the collection were saved, but some parts of the entomological collection were lost entirely. The books in the Archaeological and Natural History libraries were removed by Attendant staff, sorted and stacked in other parts of the museum, although some of the natural history reference books were lost in the blaze, many less badly damaged book were later conserved. Extensive insurance cover held by the museum allowed for amongst other salvage costs, purchase of new collections furniture and more easily replaced items such as books.

Although undoubtedly a disaster, the fire led to major building repairs being carried out, floor loading and structural problems being addressed and displays unchanged since the 1940s being replaced. The

Kent Archaeological library had a superb refit. The constant building work over several years did however make a stressful time for staff.

Information supplied to K.J. Andrew by V. Tonge and G. Sheppard of Maidstone Museum.

Points to think about

- MGC standards for collection care require an automatic fire detection and alarm system to BS 5839.
- Although all UK public buildings are required to have a fire alarm, it may only be a manual system and not automatic, i.e. if there is a fire the alarm has to be set off manually and serves only to make people inside the building aware of the need to evacuate; it may not call the fire brigade. If a fire breaks out at night in a building with this kind of alarm, the fire brigade will only be summoned if someone else notices the fire and dials 999.
- Some intruder alarm systems with infra-red motion detectors may pick up the movement of smoke. Break glass detectors would presumably be activated if an arsonist broke a window.
- If you have smoke and heat detectors in your building, check that the calling system is automatic.
- If a building move is on the cards, a new wired-in automatic fire detection system (an expensive short-term investment) is radio operated and portable. Re-useable systems can be supplied by some companies.
- What sort of fire station serves your area? In remote areas, some fire stations are operated by volunteer fire crews on call and will therefore take longer to respond since the fire crew (like lifeboat crew) are called by pagers from another place of work.
- A system incorporating sprinklers is the best safeguard against fire damage. The volume of water discharged by sprinkler heads over the immediate area of the fire is far less damaging than the several hundred of gallons per minute pumped by fire hoses.
- Halon systems are also very effective but under Montreal Protocol on CFCs can no longer be installed as new.

Further information from:
MGC Standards for Biological and Geological Collections (Numbers 2 and 3) include a very thorough standard for the protection against fire with a list of sources of advice and help.

Kate Andrew

Next Issue: Flood

pp. 203-242) this reaction is brought about by the anemone's SS2 endodermal nervous system (see below) which partly controls mouth opening and requires Mg^{2+} cations to block the Ca^{2+} channels and prevent associated nerve endings from firing. In this blocked state the anemone will die and many start to autolyse and decompose which leads to problem 3.

3. Determination of the end point (EP) of narcotisation where a narcotised anemone no longer reacts to any stimulus but is still perfectly intact and has not started to decompose. Visible decomposition normally occurs after about 20 minutes after EP has been attained so that exact estimation or recognition of EP condition is essential. Since it is almost impossible to recognise such a narrow time parameter, coupled with the risk of causing closure by premature fixation or losing the specimen as it autolyses, the problem can only be easily overcome by placing the container of narcotised specimens into a deep freeze approximately 30 minutes before EP is estimated to be achieved. This also has the effect of enhancing narcotisation but can only be effectively carried out with pre-cooled specimens. Room temperature experiments will need to be moved to a cooler environment at least one hour before EP. Introduction of a fixative may also cause tentacle shrivelling due to osmotic syneresis especially noted in (*Anemonia viridis*). Introduction of fixative at low dilution levels has been found to be too slow to halt autolysis.

Narcotising techniques ideally need to be capable of accommodating these problems without becoming too cluttered with physical inducements to keep the specimens from closing. Workers in the field can then carry out effective narcotisation without the burden of complex equipment.

The species narcotised in these experiments are listed below in order of decreasing ease of induction to EP:

Calliactis parasitica, Adamsia carciniopados, Anemonia viridis, Edwardsia tuberculata, Corynactis viridis, Caryophyllia smithi, Cereus pedunculatus, Actinia equina, Urctina felina, Actinia fragacea, Metridium senile (see below) and *Bunodactis verrucosa*.

Specimens of *Sargatia* spp. were not found in sufficiently large numbers for experimentation and there were only enough specimens of *Metridium senile* for one experiment.

RELEVANT NERVOUS SYSTEM PHYSIOLOGY

Muscular actions in Actiniaria are controlled by the following four nervous systems that act independently or interact with each other.

1. Through-conducting nerve net (TCNN) controls fast or slow contractions, caused by stimuli throughout the entire animal.