THE CAVES OF THE ISLE OF PORTLAND

by

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With additional material by Mike Read and Andy Mactavish.

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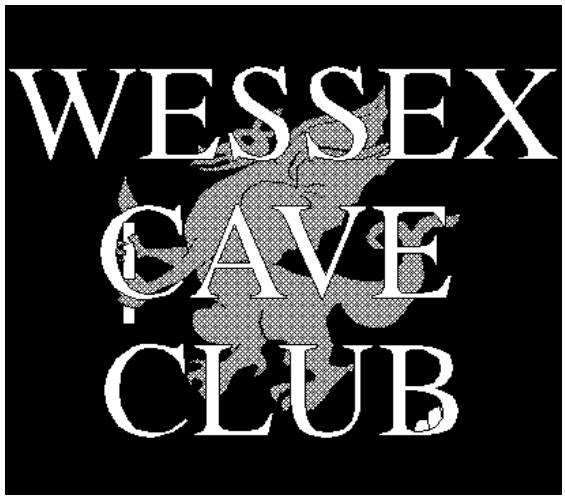
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The Caves of the Isle of Portland

Mike O' Connor and Nigel Graham

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Revised for Mendip Cave Research Archive, June 2017 – Nigel Graham

IMPORTANT

The authors and publishers have taken all reasonable care preparing this book. However they cannot be held liable for any errors or omissions in content, nor for any loss or damage resulting from using this book.

Some descriptions contained in the guide omit any mention of a need for lifelines. This does not mean a lifeline is not needed. Your safety, and that of your team-mates, is your responsibility.

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Contents

Please note: the revisions for this MCRA version, and subsequent filing, may affect page numbering and layouts. We would like to apologise for any difficulties this may cause.

Acknowledgements

This guidebook would not have been possible without a great deal of work by many people over the years. It records the reasonably systematic, if somewhat spasmodic, exploration of Portland's caves by several groups over the last 30 years.

The authors thank all who have assisted and encouraged our work, especially (in no particular order) Phil Strong, Martin Crocker, Wayne Brown, Eddy Waters and Dominic Sealy (for field work); Mike Read (for Blacknor Hole work); Dr Roger Cooper, Pete Ryder and co. of MSG, (for Westcliff caves information); the past members of Dorset Caving Group, Hardye's School Combined Cadet Force, Weymouth & Portland Venture Scouts and Leicester University Speleological Society for their systematic records of the area's caves, Andy MacTavish for notes on HSCCF explorations and Ray Milverton and Mike Dewdney-York for historical information. Various visitors' contributions to exploration on Portland are duly acknowledged in the text.

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For copyright permission, we thank Ordnance Survey, Pete Ryder and Dr Roger Cooper (MSG), Dr Trevor Ford (LUSS) and Mike Read (WPVSU).

Production was handled by Nick Williams, Claire Boomer and Mike Dewdney-York, of Wessex Cave Club.

This book collates reports by HSCCF, WPVSU, LUSS, MSG and DCG, some via the *Dorset Caving Group Journal* (1971-1980).

2017: Mendip Cave Registry Archive

MCRA accepted the authors' offer to place the book's mss with it, in digital form. We thank Mike Read for agreeing this, as some significant parts reflect his and his fellow-WPVSU members' work.

The text was revised to up-date cave descriptions, principally reflecting the loss of many of the caves to quarrying, and some minor editing cleared a few textual loose ends or added newer details. The basic mss was given to MCRA as a single Microsoft "Windows" file, less the surveys and diagrams requiring separate scanning. This preparation, and subsequent archiving, may lose some pagination consistency.

– *N. Graham, July 2017*

Introduction

The caving area of the Isle of Portland, Dorset, probably earns the over-used adjective "unique". Portland is about 4 miles long by $1^1/_2$ miles at its widest, is heavily built-up where it has not been quarried away and its cavernous limestone is only about 70 feet deep. Nevertheless it contains three distinct forms of cave, some with unusual features, varying in sporting and scientific interest. The geology is detailed in a later chapter, but summarising the cave types here will aid understanding the guide descriptions:

- Water worn caves

  These are Portland's oldest. Near-horizontal bedding means the passages resemble those of Yorkshire Dales caves, but further similarity is debatable. The existing passages are all erosion or quarrying remnants.

- Rift caves

  Large rift, or mass-movement, caves are fairly unusual. Groups occur in the Cotswold Hills, North Yorkshire and elsewhere: onPortlandthey form the largest category, following the massive jointing. Rifts are mechanically formed by rock movements, which on Portland are probably alive and well.

- Sea caves

  Numerous sea-caves girdle Portland Bill, the southern extremity of the island, where the limestone dips below sea level. They are typically large joint and/or bedding-plane chambers, some utilise rifts.

The water worn caves were all fossil long before the rifts developed, as simple observation shows. Some rifts have intercepted karst passages, giving peculiar hybrid systems.

Access and Conservation

Note: *Although we have thought this section out very carefully and have referred to publications explaining countryside-access law, neither we nor the publisher can be held to be giving legal advice in any form, so are not therefore liable for any errors or omissions.*

To date, Portland is free of formal access controls, but all land belongs to someone, primarily the Crown and the quarry companies here. Some land is common, with its precisely-defined rights of access and activity, originally established for sound reasons in the days of rural subsistence, but now causing problems impossible to foresee then. The coast is almost entirely a geological and biological Site of Special Scientific Interest (SSSI). The public have for years enjoyed open access to most of these areas, especially the coasts, for reasonable recreation such as walking, climbing and sea-angling. Consequently we regard caving historically as one such recreation.

Nevertheless, such openness demands common-sense, especially with active quarries and housing estates over much of Portland. Most of the active quarries are physically fairly open, but must be avoided during working hours. Coombefield Quarry at Southwell is now securely fenced, gated and guarded. If you venture into active quarries, unless by permission, do so after hours and keep off plant, vehicles, etc. You enter the quarries -active or disused- entirely at your own risk. Legally, you are of course trespassing in active quarries unless you have permission, - which may be denied - and if asked to leave, do so .

Any changes to the present informality will be announced in the caving press.

Warning: *Recently the National Caving Association and the National Association of Mining History Organizations have shown that the Health and Safety Executive regard even disused mines and quarries as being under its jurisdiction. Thus, organised educational or commercial groups exploring mines could be contravening HSE legislation.*

The NCA, NAMHO and HSE have together drawn up guidelines for leaders intending to take such groups into mines and quarries, based on the Cave Instructor Certificate and the Local Cave and Mine Leader Assessment

The NCA's booklet "Legal Aspects of Access Underground", by P.T. Mellors (1988), obtainable via BCRA or caving book stockists, is a useful guide to this thorny subject and certainly ought to be in any caving organization's library.

There are no mines on Portland, just open quarries. Some Purbeck (East Dorset) stone mines are open and accessible, but they are very unstable.

Please look after the caves! Sadly, too many caves have suffered from the inconsiderate and the ignorant. Some have been trampled into submission by over, uncomprehending, use. Worse, formations have been stolen from several sites. One Portland cave was needlessly modified by an outdoor activities centre for spurious safety reasons, with no thought of consulting its discoverers.

Caving is fun, IF you approach it properly, but caves are NOT adventure obstacle-courses. Caves are fascinating natural features which are easily damaged. Too many people venture underground, emerging muddy, tired and (hopefully) happy, but don't know what they saw and know less of any damage they may have caused. Don't be like them! It is very upsetting to return to a cave to find formations destroyed, graffiti, litter and the place a muddy shell. It worse still for a cave's discoverers ....

What can be damaged underground, not just on Portland, but anywhere? Calcite formations are fragile and must not be handled or struck. Even if you do not break them, you will muddy them, irrevocably. Moonmilk (the white, soft, rather fluffy, deposit found in several Portland caves) must not be touched. Similarly, avoid unnecessarily trampling or handling mud formations (drip pockets, flows, cracked mud floors) and silt deposits. Leaving litter, carbide residue or graffiti is obviously wrong: removing formations, fossils, etc. ("souvenirs?") is completely taboo (illegal if the cave is a Site of Special Scientific Interest).

Most guide-books include a Caving Code. This is one not apparently composed by a committee:

- Take nothing but photographs.
- Leave nothing but thoughtfully-placed footprints.
- Cave Safely: use appropriate equipment and techniques.
- Cave Softly: respect the caves for their own sakes.
- Think of those yet to see the caves.

Last but not least, drive carefully through housing estates; park considerately and respect the residents' privacy.

Cave Rescue

There is no local cave rescue organization. There are a few local cavers able to assist, but those with the most rescue experience are those most likely to be caving in other regions at the time, especially at weekends!

Portland is in the Mendip Rescue Organization's area, by the official definitions of the various rescue organizations' areas of responsibility. If an accident occurs of sufficient severity to require MRO assistance and equipment, remember cavers from Mendip would not reach the casualty for at least two hours from call-out - possibly longer in heavy traffic. Therefore, regard your team as its own rescue organization as far as possible. Do not hesitate, however, to seek help if not to do so could further endanger the casualty.

To initiate a cave rescue on Portland, dial 999, ask for the Police and then ask for Cave Rescue. Dorset Police will thensummon the MRO via Avon and Somerset Police. It is important tofollow thisprocedure for both communications and insurance purposes. Ensure you will be called back by an MRO Warden and wait at the telephone for this. Arrange to guide visiting rescuers to the cave if necessary.

In the cave, make the casualty as comfortable as possible, render first aid and keep him warm. Shock, rather than cold, is the more immediate problem in most of Portland's dry caves, although strong winds can induce powerful cold draughts through the passages. Improvise a windbreak if necessary.

The most likely hazards on Portland are falls; either you fall off something, or something falls on you. An embarrassing possibility is that of sliding down some narrow, greasy, smooth-walled rift - then being unable to free-climb out (it's happened!). Do not underestimate these rifts: better to find a present ladder unnecessary than an absent ladder vital. Take particular care around the sea caves. You could be in serious trouble if you become tide-bound at the Bill. The under-cliff slopes are high, steep and often slippery, whether wet or dry. Although this is not an objective hazard, anyone with a poor head for heights may find an extended tour of the under-cliffs something of an ordeal.

Cliff or open quarry-face incidents come under the local Coast Guard Service Cliff Rescue Team remit.

Using This Guide

We do not list every last fissure on Portland. Most of the sea caves, and some possible rifts, remain unexplored as they are not particularly accessible. The quarries open up new caves - and often destroy or bury them soon afterwards. The lost (buried or quarried away) caves have their own section.

As usual, the cave directory is alphabetical, but the locations of most are appended by area, in the next chapter. Many Portland caves lie in distinct sets, *e.g.* along a cliff face, so to avoid duplicated instructions, bulk locations are used with area names in parentheses alongside each cave name. There are a few exceptions for isolated caves.*e.g.*

"FLAGPOLE RIFT (Grove) 7035 7224.

Read through the "Grove" area description to Flagpole Rift, in geographical rather than alphabetical order."

Grades are not given. The water worn passages are generally fairly easy. Some rifts contain difficult climbs and traverses on huge, blank, greasy walls and frequent loose boulders. Specific notes are given where necessary.

Treat tackle notes carefully. Any bolts placed are likely to be anything except M8 and anyway are probably now past it. Finding safe belays in these caves is an art; take a few extra slings. Caves reached by open face climbs require a degree of rock-climbing skill on the part of the leader at least (and tackle for non-climbers in the team!)

Clothing is obviously personal choice. However, from experience some locals prefer "grots" and boiler-suits to fleece and plastic suits as Portland caving garb. The abundant chert damages clothing readily,

besides, most of these caves are dry and relatively warm. Sandy Hole is a possible exception here, with its hundreds of feet of muddy crawls.

Lighting, too, is personal, but note the lack of water for acetylene lamps. The good old Premier cap lamp has some advantages over bulkier lamps here, but please take spent carbide home with you and don't dump it in the caves.

Abbreviations used in this guide:

BCG	Bridport Caving Group
BCRA	British Cave Research Association
CRG	Cave Research Group (of Great Britain)
DCG	Dorset Caving Group
HSCCF	Hardye's School Combined Cadet Force
Ind	Independent
LUSS	Leicester University Speleological Society
MSG	Moldywarps Speleological Group
P.I.S.S.	Portland Independent Speleo Group
PdCG	Portland Caving Group
WCC	Wessex Cave Club
WOEC	Weymouth Outdoor Education Centre
WPVSU	Weymouth & Portland Venture Scout Unit
WVS	Weymouth Venture Scouts
(W)YAC	(Weymouth) Youth Activities Centre

Other abbreviations, for roads, compass points, etc., as convention.

(WOEC is the same organization as Y.A.C., revised and re-named in 1991.)

Dimensions

The primary units are Feet (ft), reflecting most of the surveys and descriptions used. The main dimensions have accompanying metre equivalents, at 1 m = 4/13 ft., which is accurate enough for our purposes!

A Furry Footnote

To a Portlander, those furry things are NOT r*bb*its. The old belief lingers: locals call them bunnies. Daft superstition? Perhaps, but don't offend anyone over it!

The caves

Throughout this text, left and right are taken to refer to the direction of travel indicated.

Some recent local cavers, unaware of the original names, have coined their own names even for some long-known caves. Such nicknames are omitted here. We give the caves' original, previously-published, names, with early alternatives or confusions where appropriate. Those who use "private" names for caves and locations should consider the implications in the event of a rescue call-out - this problem has already arisen.

ADMIRALTY RIFT (Verne) 6963 7345 L.97 ft (30 m)

Rather loose rift in south wall of Verne Ditch, its entrance in a boulder gully formed by partial collapse. Solutional features suggest water as well as mass-movement helped form this cave.

ALLOTMENT DIG (Grove) 7034 7230

See Grove Cliff Caves.

ANNIVERSARY RIFT (Westcliff) 6793 7134 L.58 ft (18 m)

A wide, choked fissure, about halfway between Steve's Endeavour and Sandy Hole, invisible from above or below. HSCCF found it by inspired guesswork in 1973 (Queen's Jubilee Year). Description: A.J. MacTavish (1973, pers. comm.)

Fifty feet (16 m) of ladder is needed, from an earth anchor, as is a lifeline. Hurl (sic) ladder over. First 15 ft are at 45° and loose. Ladder then drops vertically 15 ft to a wide platform, dropping 150 ft vertically on the sea side and 20 ft into the cave. Vast opening, bus sized. Belay second ladder to first. Once inside this wide rift a bend is visible after 20 ft. Superb chimney up for 15 ft to top of boulders and proceed up stal. floor to earth blockage. Start digging: this could be one of the big ones!

N.B. It is possible that this cave, as now known, is only a ceiling. Other rift caves are at a lower level, in this one the grass roots cannot be far overhead.

ARC RIFT (Southwell)

Lost.

ARIEL CAVE (Westcliff)

Blacknor Hole by another name. This has long been debated, but correspondence with A.J. MacTavish as well as widespread publication already suggests Blacknor Hole as the 'correct' name. Ariel (Tunnel) is the system's main passage.

HSCCF's announcement of the cave's discovery in "Descent" (MacTavish 1975) used only the name "Blacknor", once only, on their survey, though MacTavish (DCG archive material) uses "Ariel". The name was inspired by their first trip, after an aerial photograph had shown the entrance, being whilst a "Tempest" raged.

Both names are used by local cavers, apparently to taste and this book uses "Blacknor Hole". Both are acceptable.

AUSTRALIA RIFT (Wakeham)

Lost.

BILL SEA CAVES (Portland Bill, north of Pulpit Rock)

This is a group of sea-caves (modified rifts) around the headland at 675 686, not completely explored, nor surveyed

Warning: this is a dangerous area, with powerful tidal currents whose relationships with the tide heights are rather complicated. Seek local advice from experienced divers or boatmen. Some of these caves are accessible only by boat or by swimming, the latter only by experienced, strong swimmers, preferably with a wet-suit and possibly buoyancy aid and anyway only in calm conditions.

Access: the only legal car-park is the pay-&-display. From here, walk south west through old quarries to corner of Ministry of Defence enclosure, follow fence north along ledges. (Pulpit Rock is south of this point, a stack remaining from an arch destroyed by 19th. C. quarrying.)

Three large caves are visible in the headland. The right-hand one is known by local cavers as WHITE HOLE, but this may be an error. The O.S. map places White Hole close to Pulpit Rock.

White Hole is an impressive rift narrowing inwards from an un-roofed entrance on the quarried terraces below the Raised Beach formation, at 6752 6860. At high tide the sea washes over the beach below the 40 ft (12 m) entrance pitch. The pitch has been bolted for SRT, but the M8 anchors are not expected to last long in these briny surroundings. There are virtually no other belays about. Alternatively, climb down near an un-roofed rift a short way south, then swim in.

The cave starts as a fine day-lit chamber, tapering to a greasy fissure ending tight and choked. The washed-in debris demonstrates why you don't want to be down there in a storm.

Next west, round the corner of the headland, is an entrance divided by a rock pillar, into a rift estimated as 100 ft (31 m) long. It ends blank at a small, steep, gravel beach, the only part of the cave not occupied by deep water. (Explored WCC Summer 1993).

West again is a very large cave, not yet explored.

Around the headland is BLOW HOLE (6750 6880 Unsurveyed)

Grid reference is for the Blow Hole itself, which is marked on O.S. maps, but which is beyond high fences so not accessible. We describe the cave below it.

Warning: The foreshore and the cave are cut off and partially flooded at high tide, by water which is deep in places. Beware the currents!

From the public car-park at Portland Bill, head NW past the MOD compound to the cliffs, then north to radio aerials and buildings at 676 692. Nearby is one of various devious, scrambly paths down from the cliff top6 692 (hand line useful, stake in place). Take great care on the cliff banks, which end

precipitously! Follow the boulder-strewn shore south, past a few bits of corroded iron bearing witness to the many shipwrecks which have occurred on this coast. The first entrance is about 100 yards (approx. 100 m) south of a rock arch in an overhang. The cave is near the limit of accessibility, beyond which the cliff drops straight into the water.

Two arched sea-caves enter a rift parallel to the cliff face. The Blow Hole is in the roof between the arches.

Explored WCC 1993.

BLACKNOR HOLE (Westcliff) 6790 7165 L.2630 ft (810 m)

(Also called "Ariel Cave", q.v.)

Portland's premier cave, containing every type of non-marine feature found locally. It demands respect for both safety and itself. It was probably continued by Sandy Hole (q.v.),via now-choked passages. In early 1994, WPVSU linked the two caves by digging in a choked rift, but the cave's own stream-way link remains unknown.

Two fossil stream ways, cross-linked by large rifts, run south-east from the present cliff-face entrances to a conjectured confluence. The united passage goes south to chokes near Sandy Hole's northern extremities. The water worn passages total some 1600 ft (500 m) length. Other rifts offer detours and one leads to the final bit of karst passage. The whole cave is therefore a hybrid. Not content with that, its karst passages have followed the underside of a chert bed in the limestone: a pretty rare phenomenon.

Warning: the cave's entrance, loose boulders and extensive chert-ridden crawls would render a rescue a major proposition, as has been proved. This is not a beginners' cave, still less an adventure-venue.

Good knee-pads are advised, with hundreds of feet of crawling on abundant sharp rock fragments. A trip to the far reaches, with time to look around, can take 4-5 hours or more, excluding exploring all the side rifts. The cave is generally very dry and thirst-inducing!

Entrance:

NB: Use full SRT gear, despite the simple abseil-only rigging.

Also note this reflects the situation at time of original writing. Since then, P-hangers were installed on the cliff-top under BCA auspices; but in the 1990s, a dispute with the former owners of the fort above the entrance, led to their loss, and to date – 2017 - these have not been replaced. Some trips have been made uphill from Sandy Hole, but while a sporting way to see an already severe cave, unfortunately it risks dragging mud up from Sandy Hole to spoil Blacknor Hole's clean-washed passages in white limestone.

Ariel Entrance is 35 ft (11 m) down the 105 ft, slightly overhanging cliff fronting Blacknor Fort. Old stakes and a newer ring-bolt mark the pitch-head. Most people prefer to abseil in (and out!): belay 120 ft (40 m) rope to the ring, backed by the stakes. Better use your own stakes if possible but remove them after the trip. Use a rope protector on the edge: there are no re-belay points, but with careful abseiling, this does not seem to be a problem. The first down has an amusing move into the low passage, then belays the line to a large angle-hanger. The chain outside was intended as an exit re-belay. Tie the rope well into the cave once all are in. This is most important: not only would any breeze blow a loose rope out of reach, trapping you, but there have been cases of vandals interfering with ropes upstairs. Alternatively, rig a pull-down system.

The pitch may be laddered (return up only if you have a reliable lifeliner/sentry!), an "interesting" option.

Do not obstruct the footpath: the Highways Act 1980 makes obstructing a public way with a wire or rope a specific offence. The only possible exception here would be for a rescue. Do not venture onto the fort bank: the buildings are now private houses.

Main system:

You are now in the cave (at last!): ARIEL TUNNEL, its main passage, to be precise. A low crawl passes a window to the cliff and ends at a rift junction: PICCADILLY CIRCUS. Left are LEFT and RIGHT TWIN CRACKS, right is 2-level C&A RIFT (Churchill & Avery)*. Ariel Tunnel continues ahead. The rest of the cave will be described as a round-trip, with the 1986 Extensions and the side passages appended, a popular way to see the cave, partly as it breaks up all that crawling and stooping!

Ariel Tunnel continues low, crosses TANGERINE RIFT, then changes from bedding to vadose form. Step carefully across GRAND CANYON rift into higher, narrow passage to a dug hole into THE CONFLUENCE.

Ahead is a roof-tube to the 1986 EXTENSIONS. Right crosses choked FAIRY RIFT (grotto above) into VIA AQUAE SULIS, honouring its Bath University Caving Club finders, to large NUTCRACKER RIFT. Cross to a crawl among loose, greasy, boulders to a small boulder chamber. A low crawl (GRASSHOPPER SQUEEZE, after Paul Grassby*) leads across another rift into a bedding chamber and FOOL'S PARADISE.

Right, QUERY RIFT ends at a stal choke with a fine upper grotto: a hole in the choke is the unlikely THREE-STONE SQUEEZE back into Grand Canyon - the two rifts are really one. Fool's Paradise recalls its DCG discoverer, who had soloed away from his companions, rushed back to them with the good news, then forgot where he had found it! The water worn passage lowers, crosses C&A Rift on a false floor and becomes a low crawl in guano to the cliff face at QUEEN'S ENTRANCE south of the Main Entrance (a misnomer: a large overhang precludes anything but exiting only).

To return to Piccadilly Circus: coming from Query Rift, turn either left or right at the C&A Rift crossing. If right: climb up the corner to a high-level series of false floors, short traverses and slippery climbs finally descending past the massive EROS BOULDER into P.C. If left: descend boulders, doubling back down below the junction, follow a narrower lower level back to a slippery climb up from below Eros, into the Circus. (Ahead from the boulder slope are the lengthy far reaches of C&A Rift, eventually pinching out.)

1986 Extensions (Description: M. Read)

NB. This series is guarded by a very unstable choke. This, plus the general nature of the place, makes the far end quite remote. Rescue from here would be extremely difficult and hazardous. It is no place for the inexperienced.

From The Confluence, follow the roof-tube, WRIGGLE PUSH, to a tiny chamber and through a dug hole into a further part of Fairy Rift. Right chokes, but bear slightly left into an uninviting crawl through boulders (DEREK'S DILEMMA). This area is very loose - take great care, do not pull on anything.

Solid rock is regained beyond in Ariel Tunnel: you have used an old oxbow to bypass the Fairy Rift choke. Remember the choke for the return, to avoid straying into a distinctly horrible area. 30 ft (10 m) further is a short crawl through a stalagmite choke (care). Next is the Guillotine, a hole between dropped flakes opening over a rift. Traverse at the same level to another hole between boulders into COMFORT CRAWL. This has a short ovoid section, unique in a system notable for its chert seam roof.

At a broad bend, take great care to crawl completely flat below vulnerable orange straws. Keep to the path and watch each other through to avoid further damage: there is not much stal to spare on Portland.

Crawl on, to an unexpected bit of fine vadose canyon. Sadly this is very short - yes, another collapse! Up-slope, then down to the left between boulders is a narrow trench into BROWNSEA ISLAND, a fine conical chamber some 15 ft high and wide, with a "dehydrated sump" floor of limestone fragments. Its

name recalls its Venture Scouts discoverers. (Leave their cairn, but add ye not to it, nor build any others!) Return to the main passage.

Ahead, along the left wall, thrutch up and along narrow SQEZY RIFT to muddy slabs in the roof. Crawl forward, drop down a little to a balcony overlooking an impressive, straight, deep and rather intimidating fissure. Jam along to a tight section passed at about $^3/_4$ height, above a flowstone boss. Work down and along the floor to a hidden chamber on the right. This contains the largest stalactite on Portland: care.

The rift continues, becoming too tight. From the water worn chamber, crawl flat-out, feet first, to a 6 ft drop, more low, wide passage and a wriggle over collapse. Blacknor Hole ends as Vortex Passage, a bedding over 13 ft (4m) wide but less than 18 inches (0.5m) high, and very muddy, whence the rift link to Sandy Hole is gained. VORTEX PASSAGE is an obscure route including a constricted rift and shored, loose boulders. The combination of Blacknor and Sandy Holes may give the longest through trip in southern England, most of it crawling, much of that very uncomfortable, some of it muddy. Please consider the possible effects on Blacknor Hole and its formations of through traffic with muddy kit and, perhaps, bulky rope bags.

Less able climbers may prefer to treat the balcony in Squezy Rift as a pitch, some 40 ft deep (tackle details have not been established), but the fissure below the balcony is constricted and very awkward.

Detours

The various rifts may be explored: some contain flowstone and straw grottoes needing care. C&A Rift has been described. LEFT TWIN CRACK ends choked near the cliff-face. GRAND CANYON is boulder-choked disappointingly near the Ariel Tunnel bold step, although ferrets may like Three-stone Squeeze into Query Rift (described above). The northern part of Grand Canyon displays peculiar, bulbous, orange helictites. The choke beyond has been scaled by rock-climbing techniques for the full height of the rift, to find no way on. Skilled climbers may prefer SOHO: a grotto located in a cavity formed by a sideways stagger in the rift high above Piccadilly Circus. Soho contains formations called the Moses Pool and the Bulrushes: somewhat at odds with the grotto name?

Exit

Can you think of any other cave whose description includes advice on leaving? Any cliff-top belay must be inspected for security before anyone uses it. The first out relies on the belay in the entrance, then goes to the top to ensure all is well, before the last out releases the lower belay and abseils down. Protect the rope on the sharp edge.

The fine abseil is mainly free-hanging, with superb coastal views! Land on the top of the under cliff slope, follow an approximate path north to a steep slope and short scramble to the cliff top at the quarried area north of the fort. Prusiking back up is possible but protecting the rope is difficult.

Discovered 1974 by HSCCF: names thus * are of students. See History chapter. Geology: discussed in Geology chapter.

BLOW HOLE (Bill)

See Bill Sea-Caves, above.

BOWERS RIFT (Westcliff)

Lost

BULLSEYE FISSURE (Westcliff)

Lost

CANADA RIFT (Wakeham?) – Identity uncertain.

A name applied by a small group of local cavers in the 1960s, who left no written records, possibly to Cherty Rift, following a Commonwealth theme (*q.v.* Australia Rift).

CAVE HOLE (Southwell - Bill) 6865 6903 Unsurveyed

Single-chamber sea-cave, with a top entrance in a depression close to the cliff edge. The top entrance has been closed by a steel grille for many years. In 1989, the Crown Estate Commissioners decided the grille was dangerously corroded, so covered it with massive stone blocks, denying all even the view into the cave. Local councillors objected to this unsuccessfully, so Nature intervened. Violent storms in January 1990 lifted the blocks clear and dropped them back randomly, breaking some. They have been replaced. The cave is said to be enterable by climbing down the cliff a little to the south, otherwise use a boat.

Dorothy Gardiner, in *Companion into Dorset* (1937), describes it thus:

"South of the Shambles... is the terror and grandeur of Cave or Keeve's Hole. A dome-like passage, it is perforated at the top.... When a storm from the south-east blows into it, a large column of water is forced up feet through the hole. The opening is widest at the summit; it narrows to 7 or 8ft, then opens out again into a large subterranean cavern, 50ft square & 20ft deep. ...in a fierce storm, small sailing craft have been driven in... in 1780 a cowss *(sic)* ship of 40 tons was forced in. In the west part are two caverns to which no end has ever been found."

The Shambles name is an oddity, as it is that of a sand bank several miles out to sea south-east of Portland Bill! It may have been also a local name, now dead, for a quarried area near Cave Hole. A much smaller, but still impressive, blow hole exists near the southernmost crane.

Source: *British Caver* 13 pp33

CHERTY RIFT (Wakeham)

Lost

CITRUS RIFT (Wakeham)

Lost

CLAY OPE DIG (Westcliff) 6818 7205 Alt.280 ft (86m).

Portland's least accessible surface dig! Follow a ruined path south from beach huts at Chesil Cove (6835 7310), below slumped West Weares (old quarry tips), to hillock of slipped Portland Sands. Go along bouldery beach to north end of obvious bay, with dig clearly visible in cliff above centre of bay. Scramble over boulders to flat area below huge clay slip. At south end of slip, ascend brambly boulder ridge to base of extremely steep grass slope. There may be a dodgey hand line in place, safer to assume not. Climb, using small pickaxe or old ice-axe for aid, to prominent boulder with anchor, install doubled

100 ft (33 m) hand line for followers and for return. Warning: exposed site may mean anchor is badly corroded. Expendable rope sling advised. Slope eases up diagonal scree run to base of cliff proper and very exposed 12 feet (4 metres) climb to entrance. Protect climb to ledge and the move into hole. It takes about an hour to reach here from Chiswell sea wall.

Currently (1993), we do not know if the site is a choked cave or merely an alcove, full of water-graded gravel and sediments. Digging on Summer evenings, 1988- (WCC/Ind.), entered a small cavity with a tiny passage to daylight at the side of the choke and solid sediment ahead. The location seems to deter regular digging spells.

If an evening trip is undertaken, allow time to regain reasonable path in no more than early dusk. Negotiating boulder slopes on the surface by lamp-light is far more difficult than the subterranean counterpart.

COFFIN HOLE (Grove) 7034 7237 L.130 ft (43 m)

Easy crawl in dusty, (de)relict stream passage to shattered area and choke, probably of cliff retreat debris. Possibly part of the Grove Cliff Caves group; probably related to the phreatic remnant in block left by minor quarrying on the cliff top above.

CROCODILE CANYON (Southwell)

Lost

DEVIL'S HOLE (Inmosthay)

Lost

DEVIL'S SLIT (Inmosthay)

Lost

DOLPHIN RIFT (Wakeham)

Lost.

DURDLE RIFT (Grove) 704 718 approx. L. 45 ft (15 m) Unsurveyed.

Short, loose rift ending in boulder choke. Use 150 ft (50 m) hand line doubled for descent from entrance. This is the only cave in this stretch of cliffs. Found, WCC 1993.

EMIGRES' RIFT (Southwell) 691 702 approx. Unsurveyed

On upper quarry terrace just south of Chene House garden, above Freshwater Bay. (A steep scrambly path from the quarry down to the beach and Red Door Tunnel is now appearing)

Narrow, greasy , awkward decorated fissure entered at the top of the limestone. Difficult chimney: handline advised, belayed to beam c. 4ft long laid across the entrance (not provided).

Explored to c.30ft (10m) long and deep, December 1994 by Dominic Sealy (WCC) and Phil Strong (Ind.), shortly before Dominic moved to Norfolk - and Phil emigrated to New Zealand.

ENGINEERS' HOLE (Inmosthay)

Lost

FLAGPOLE RIFT (Grove) 7035 7223

See Grove Cliff Caves.

FOSSIL CAVE (Grove) 6966 7237 L.300 ft (93 m)

The entrance is litter-strewn by local children playing in it, but low muddy crawls help conserve the pretty bits beyond. Beware of broken glass. Roomy joint-controlled phreatic passage slowly becomes flat-out and locally constricted by formations, then enters a low bedding chamber. Decorated passage beyond becomes too small. The small curtains are notably tooth-edged, a common feature but with no certain cause (Ford 1988).

The cave has been open a long time and bears the alternative name Thrutch Cave.

Threatened by fly-tipping that already makes the approach difficult, hazardous and unpleasant. Persons Unknown gated the entrance – then others, probably *not* cavers, removed any padlock.

GEMINI RIFT (Westcliff) 6775 7150. L.210 ft. (65 m)

The obscure entrance is at the head of a choked rift forming an shallow gully on the cliff-face, above a steep hummock of loose earth and guano a little south of the distinct pinnacle formed by collapse. The pinnacle is the remains of the outer wall of a rift: note the weathered stal still clinging to the face above Hopeless Hole (to the north).

Approach is a V. Diff. climb, of some 20 ft (7 m). Find something sound to belay to, for top-roping or for a ladder for non-climbers (lifeline necessary).

From the entrance, a second drop, past a jammed boulder which obscures the view down rather disconcertingly, is the Coat Hanger. The chimney down is rather awkward; slide down to the right of the boulder first. At the head of a rising slope and short chimney up, pass over or to either side of a boulder then descend a 27 ft. (9 m) chimney.

The next feature is Ferret's Entrance, a very tight cross-rift forced by DCG ferret Melanie Glover to emerge on the cliff at the head of a steep scramble down a loose, sloping ledge. Negotiate it a few feet above the floor. Its greatest width is about 10 inches. Beyond Ferret's Entrance, the main rift becomes too tight past a vocal link to Steve's Endeavour.

It is rather sobering to realise that Gemini Rift is entirely within the slab being parted from Portland by Steve's Endeavour! The name: its DCG discoverers noted its being one of a pair of rifts, and it containing two pigeon chicks, and two bats, all on the surveying trip (October 16th. 1973).

GLOW-WORM RIFT (Southwell) 6910 7045

Lost

GROVE CLIFF CAVES (Grove) L.670 ft (220 m) surveyed

The system consists of Flagpole and Guano Rifts, and the short water-worn cave Allotment Dig, are joined together internally by a passage called LINK RIFT. Additionally, Skittle Alley Rift is connected to Flagpole Rift. In north-south order of entrances, i.e. as found along the path:-

Allotment Dig

Short roomy phreatic tube to cross-rift. Below is a dig, searching for the continuation of Coffin Hole (*q.v.*). Ahead, locally-constricted Link Rift leads to a narrow chimney dropping into Guano Rift. The tube was completely cleared of silt 1986-87. The entrance gained a "Danger – Electricity" sign in 2012, when a trench for a new street-lamp cable grazed the cross-rift!

Guano Rift

Steep earth slope, no longer covered with guano, rises to large rift chamber terminated by a huge flake. Right of the flake a hole among unstable boulders drops ten feet awkwardly to a lower level in relatively wide rift, stopping all too soon at a T-junction with Link Rift. (Rope useful for novices). The climb originally passed an interesting rocking boulder, demolished by persons known for "safety", quite unnecessarily. Right ends at the narrow chimney up to Allotment Dig. Left is a climb and wriggle through to Flagpole Rift at the Letterbox.

Back in the entrance chamber, steep boulders rise to a balcony above the entrance ramp. The balcony has been used an SRT training pitch (about 40 ft).

In c.2015, WCC cavers identified the possible remnants of Allotment Dig stream-passage in the walls of Guano Rift.

Flagpole Rift

A fine example of its type, the cave has long been popular, but recently has become a little over-used.

Short scramble gains slope ascending behind stack to entrance proper (on right at head of slope). The cave is a set of mass-movement rifts at roughly right-angles, forming several T-junctions. The main way is obvious, including a lengthy straight to Concrete Corner (note the artificial flowstone!). Turn right (into Link Rift), ascend boulders to a choke. Two ways through: the tight Letterbox Squeeze opening over the drop, or short dug bypass just right of the Letterbox.

Left from the bypass is the Letterbox exit and chimney down into wider rift. Climb up through a second choke to a slippery eight-feet drop (slings for return) into a horribly-loose final chamber. Right at Letterbox Bypass, a narrow slot descends into Guano Rift.

Three side passages add to things. The first T-junction within the cave looks choked left: in fact a 10 ft chimney gains a squeeze over the choke, into large rift. Beware loose boulders. This is Skittle Alley, choked right, but left leads over a blind pit to narrow fissures out to Skittle Alley Entrance.

At the second junction, thrutch narrowly ahead to find a very tight and awkward window to the cliff.

The third diversion is Tibet, as it is awkward to enter and its first known explorers were the YAC. Turn left at Concrete Corner, through a very narrow fissure, (Link Rift again!) into a sizeable passage between massive chokes (the rift is really part of Skittle Alley Rift). Please accord it respect - it is now

the only part of the entire system still retaining much of its original appearance, with its wall mud and moonmilk.

Skittle Alley Rift

Entrance in inside corner of cliff just south of Flagpole Rift entrance, above ivy-clad slope. Narrow, crumbly fissures zig-zag to a short crawl into much more spacious rift in much more solid rock, at the blind pit described in Flagpole Rift.

The main rift is part of Tibet in Flagpole Rift, separated by the choke. Its name is obvious if members of a private club somewhere overhead are playing skittles: the distinctive rumbling sounds are rather eerie!

Flagpole Rift was linked by digging to Guano Rift and Allotment Dig in 1986, creating Portland's third-longest system. Skittle Alley was found from Flagpole Rift, then its entrance was dug from the outside in 1989. The system is popular with novice (sadly, heavy adventure use in 1988-90 battered the place terribly) and offers intriguing traverse problems for the more experienced.

GROVE CLIFF FISSURE (Grove) 7037 7218 L.200+ft (62 m+)

Entrance reached by difficult climb up choked fissure, overhung at top by large block. Typical rift followed at various levels on jammed boulders. At dripping inlet, way on is through a vertical squeeze at the lowest level, then the passage opens out again for an estimated 100 ft (31m) to a choke.

Warning. The whole cave is extremely loose.

GUANO RIFT (Grove) 7035 7228

See Grove Cliff Caves.

HIGH-ANGLE BATTERY (Verne) Centred: 6943 7326. Artificial

Interesting for military historians, this late 19th. Century coastal battery contained massive mortars designed to project shells onto the thin deck armour of contemporary warships. The guns, never fired against an enemy, were scrapped as obsolete about WWI. The Battery would have been impregnable from ships, even if their guns had the necessary elevation, as it is a considerable distance from the cliff edge and in a quarried depression at about 400 feet (120 m) a.s.l.

Only the gutted main buildings survive, as a scheduled Ancient Monument. Parts are gated, but one of the magazine tunnels was found open by the writer. A lofty tunnel, enterable at either end, has chambers off its sides, explorable simply by torch light.

HIGHER HEADLANDS QUARRY CAVE (Grove) 6962 7243 L.45 ft (15 m)

Obscure entrance in small corner of south face of quarry may be partly obstructed by rubbish. Beware of broken glass. An awkward corkscrew formed by an abrupt change in passage cross-section enters flat-out crawling in a bedding plane, relieved at intervals by small cross-joint chambers.

Digging the terminal collapse may be well worthwhile. Significantly, the cave lies in the general area of Fossil and White River Caves and may once have been linked to them.

HOPELESS HOLE (Westcliff) 6786 7154 Dig

Choked phreatic tube, probably on same horizon as Sandy Hole, though this is yet to be investigated. It runs into dangerous choke below Steve's Endeavour Rift, with which voice contact has been obtained by the WPVSU diggers - who report that formations have been stolen from this easy, vulnerable cave.

HORSESHOE HOLE (Inmosthay)

Lost

JEWELLER'S RIFT (Southwell)

Lost

KEEVE'S HOLE (The Bill)

Archaic alternative name for Cave Hole (q.v.).

KIDDIES' CAVE (Rift) (Grove) 7032 7238 L.80 ft (25 m)

Jungle-bash round the cliff below the firing-range lookout, to the entrance hinted at by looking over the wall from the lay-by above. That's the difficult bit done. Short rift to short crawl into small chamber in boulders. Local children used it as a den, hence the name.

LIEBHERRSCHACT (Wakeham)

Lost

LIMEKILN CAVE (Southwell-Bill) 688 693

Single-chamber sea-cave, un-surveyed. One of many!

LOOKOUT RIFT (Grove) 7029 7241 L.40 ft (12 m) approx.

Entrance is walled to within a few feet of the top, some 12 ft (3.7m) up. Use scaling gear, M8 anchors in the masonry, or a ladder on long tethers from whatever you can find on the road above (the private, but public-footpath, section of Grove Road). A foul cave, with deep deposits of stinking guano to guarantee a truly unforgettable, ammoniacal experience. Not recommended!

MAGAZINE RIFT (Verne) 6958 7345 L.80 ft (25 m)

Narrow fissure in south wall of Verne Ditch. The name? Lots of shells in the walls! (Fossils).

NEW PASSAGE (Inmosthay)

Lost

OUTER LEFT TWIN CRACK (Westcliff) 6792 7168 L?.

Lost

It is probably part of Left Twin Crack in Blacknor Hole, beyond a massive choke, which is just as well. The cave seems to be still enterable, via an exposed move over the cliff edge (protection needed), though its original entrance has been blocked. May be tainted by sewage.

P155 (Wakeham)

Lost

PERRYFIELD QUARRY RIFTS (Easton)

Lost

PERFIDY CAVES (Grove)

Lost

PERSIL RIFT (Westcliff) 6796 7170 L.110 ft (34 m)

Quite a sporting cave. The entrance is a slightly obscure slot between outcrops in the corner of a terrace immediately below the north-west corner of the Blacknor Fort fence.

Descend muddy slope, cross blind pit to reach head of 40 ft (13 metres) pitch. Experienced rift-cavers may free-climb, (traverse out first) otherwise rig to a dubious flake in the floor. The pitch twists, making it more fun. Short walk to tight traverse through short cross-rift into fine final section of the cave, straight, tall, fairly wide, with lots of flowstone. It ends at a stal constriction above a small pool, with a view beyond.

DCG ferreted in 1980, hoping to find an all-weather entrance to Blacknor Hole, but missed the way in. WPVSU dug in, 1983. It may just be Grand Canyon (Blacknor Hole).

Tackle: 50 ft / 16m ladder, 10 ft / 3m tether, 70 ft / 22 m line.

PULPIT RIFT (Bill) 6753 6837 Unsurveyed

Un-roofed rift modified by sea action, just east of Pulpit Rock. Thirty-foot pitch to slippery ledge above deep, surging water, so low tide and calm seas are necessary. Useful training pitch: ample belay boulders. It may be possible to climb out among boulders (watch stability). Other rifts occur nearby, some partly un-roofed, extending below the Raised Beach deposit.

RAIL RIFT (Grove) 7039 7215 L.50 ft (16 m) estimated

Un-inspiring but useful as a route to Rumble Chasm. Approach by climbing over the wall on the south side of a stone tower south of the social club. Warning: pick the right bit of wall. Here be Big Drops! Narrow entrance slot in a grassy ledge, drops 6 ft to larger passage. Short descent emerges precariously on the cliff face at the start of a rising traverse to Rumble Chasm.

RED DOOR TUNNEL (Southwell) 6915 7020 L.75 ft (23 m)

Access tunnel driven from cliff-base below Chene House, to base of well in grounds of house. Above was a pumping station supplying the dockyard, replaced early 20th Century by a supply from the mainland, when demand outstripped local supply. The rust-red door has gone, as has most of the masonry archway which held it, this part of the cliff being very unstable.

A mortar plaque on the wall at the shaft bottom carries the builders' inscriptions:

John Lea
Alfred Tuck
builders.
J. Bennett
miner.
Edward Bu. [Burt?]
engine-driver
1850

The water emerging from boulders below the entrance carries limestone sediment, presumably from Coombefield Quarries, although this has not been verified.

RUFUS RIFT (Wakeham) 6975 7118 L.10 ft (3 m) plus

Narrow fissure measured as far as a very tight double-bend with an awkward view into more of the same. It was once possible to pass the squeeze, now full of debris, but the cave ends only a few metres beyond. Collects broken glass and other litter.

RUMBLE CHASM (Grove) 7038 7215 Unsurveyed

A curiosity. Approach from lower exit of Rail Rift, or by climbing cliff from below. The former involves a difficult and exposed traverse: if the only feasible holds seem to be feral wallflowers and wild cabbages, well, they are no worse than the rock here. Enthusiastic "gardening" made the climb harder than it already was! 100 ft (33 m) lifeline essential.

Traverse ends at climb up into rift. Floor slopes away to base of stone wall. Chimney up to low crawl showing the wall divides the cave from an artificial tunnel crossing about 20 ft (6 m) below. The rift continues, but has not been conclusively explored. The tunnel has been reached by ladder belayed to bar across hole in tunnel roof, with an awkward take off (tight) and an awkward landing on pipe sloping very steeply down! Steps alongside the pipe lead up to manhole under nearby car-park, down to a grating on the overgrown slopes far below the cave entrance. The pipe probably conveys sewage, originally to sea out-falls, now to a main sewer alongside the disused railway.

SAINT ANDREW'S WELL (Wakeham) 6972 7112 L.18 ft (5.5 m)

Artificial grotto tapping a small spring, perhaps an early water supply for nearby Pennsylvania Castle, a private house. Manhole entrance at base of low cliff, into short passage to triangular chamber. The walls are ashlar masonry, the roof bedrock supported by masonry columns. Small holes in the walls admit the water.

(The ruins nearby are of St. Andrew's, Portland's first parish church, used still for the annual Rogation-tide service.)

SAINT GEORGE'S RIFT (Westcliff)

Lost

SAND HOLE (Southwell-Bill) 6885 6947 L.120 ft (40 m)

Sizeable, single-chamber (60 x 20 x up to 15 ft high), abandoned sea-cave. Stooping-height entrance, obscured by boulders and boulder slope down to muddy floor. A crawl back behind the slope soon becomes too low. Whether the cave's abandonment resulted from the sea retreating, or from quarry debris accumulating below the low cliffs, is a moot point.

SANDY HOLE (Westcliff) 6798 7125 L.1300 ft (400 m)*

Portland's second-longest cave is a decaying water-worn system, almost certainly Blacknor Hole's downstream continuation. The west-east entrance passage intercepts a north-south, slightly-lower-level conduit, all unremittingly low, (flat-out to stooping height), with many dropped slabs, but with no real squeezes in its main routes. Wear good knee-pads and gloves, as the cave's sticky mud contains shards of chert. Sandy Hole is not recommended for beginners.

The entrance is protected by a tricky climb, about 10 ft (3 m) in 1993 but further erosion of the under cliff may raise this. Combined tactics may be useful! Take a hand line for exit, doubling it round belay inside entrance. Future erosion may mean having to abseil in, Blacknor Hole fashion, or laddering Sharbutt's Rift (*q.v.*).

A sandy crawl enters a tiny chamber, then a dug squeeze enters PRIZE-DAY PASSAGE, 90 ft of flat crawling to THE INKWELL cross-roads. Left (north) is GOLD & SILVER PASSAGE. Right (south) is AMMONITE PASSAGE.

Ahead, the entrance tube wanders eastwards then bends south, hence its name, NORTH PASSAGE, to a claustrophobic old HSCCF dig in a choked cross-rift. Strong easterly winds induce draughts from this choke.

GOLD & SILVER PASSAGE starts small, ascends slightly over a stalagmite bank below SHARBUTT'S RIFT (*q.v.*), then enlarges a little as it assumes a pseudo-vadose form typical of the cave. A delicate (for you, not the cave!) crawl over large blocks is The Guillotine, where HARDYE'S HOLE opens right. Gold & Silver continues ahead, a few narrow oxbows add variety. At its northern end, a hole in the right wall enters a squalid bedding region and the head of ARGONAUT PASSAGE. Ahead, a route through loose boulders in a rift and plentiful mud, gains Vortex Passage in Backnor Hole.

Ammonite Passage opens into a low, wide crawl. Almost immediately, PAUL'S PROGRESS, heading back north, forms a re-entrant junction left. Ahead, Ammonite is some 300 ft (92 m) of crawling to a brief enlargement and a collapse (rift). Right at the choke is a tight, awkward squeeze into an old DCG

dig in a silted tube. (The whole cave shows signs of having been silted to the roof then flushed out, before it died.)

Paul's Progress is relatively comfortable, passes under North Passage (no link) and enters a small chamber, WORLD'S END, where short people can just stand upright. APATHY PASSAGE at roof level left goes nowhere special. SHITZENSTRASSE, floor-level right (while still facing north), is a muddy grovel to a choke. Tall cavers will find turning round in this, Apathy or North Passage, rather difficult.

Continuing north from World's End, immediately Hardye's Hole on our left gives us an optional return via G & S Passage to The Inkwell. Or we may continue north along ARGONAUT PASSAGE, low all the way to the squalid bedding plane (which ends silted almost to the roof, though it does draught). Left there is the hole into Gold & Silver Passage. Squeeze lovers will find WHISTLE PASSAGE fun: it links Argonaut and Gold & Silver Passages a few yards south of the main junction.

Therough trips: There have been recent embarrassing instances of cavers descending Sharbutt's Rift (see below) into Sandy Hole, then failing to find the exit. The rift opens along one wall of Gold & Silver Passage. With your back to this wall descend the slope to your left, through a short constriction, into The Inkwell only a few feet from the rift foot. The exit (Prize-Day Passage) is now the roof passage onyour right, and is seen to bend left just inside. It may emit a strong draught.

The entrance was originally dug by WCC, but Prize-Day Passage fell to Herrison Hospital cavers (see History chapter).

*Length total above was to the DCG dig in Ammonite Passage. In the 1980s, WPVS diggers entered a formidably long crawl to a boulder blocking the visible continuation; so remote it has so far (2017) deterred further work.

SAWMILL CAVE (Inmosthay)

Lost.

SEAGULL CAVE (Westcliff) 6795 7062

Short, dry, dusty, loose rift, reached by awkward traverse.

SHARBUTT'S RIFT (Westcliff) 6800 7125 VR.60 ft (20 m)

Narrow rift providing a severe, very committing, top entrance to Sandy Hole. It is smooth and greasy, virtually impossible to free-ascend and a tricky squeeze has to be negotiated a few feet above the opening into Gold & Silver Passage of Sandy Hole. Start by traversing to a large chock stone first, descend to a false floor far below, squeeze off the north end of this, crossing a narrow slot two ft (0.6 m) lower, finally slide down beyond the slot into G&S Passage. It may be advisable to attempt the route accompanied by someone who knows the rift. (In December 1991, two cavers had to be searched for after descending the rift then failing to locate Prize-Day Passage!) You can investigate the squeeze from below fairly easily.

The rift was opened by WCC in 1970, who explored it to about 50 feet deep.

SHARBUTTS TWO RIFT (Westcliff) 6798 7123 L.30 ft (10 m)

Short, fairly wide rift blocked by stalagmited boulders. It is probably the same rift as seen in the entrance to Prize Day Passage (Sandy Hole) below and may be one of two intercepting the far reaches of that cave's Gold & Silver Passage.

SHOWERBATH CAVE (Westcliff) 6795 7137 L.30 ft (10 m).

Entrance hidden from under-cliff path by its being at the back of a ledge above a short slope. Easy crawl in T-section water worn passage, to hopeless rift collapse.

SKITTLE ALLEY RIFT (Grove) 7037 7221

See Grove Cliff Caves.

STEVE'S ENDEAVOUR RIFT (Westcliff) 6785 7149 L.490 ft (150 m)

A huge cambering fissure giving some severe caving. The entrance itself is hidden among boulders jammed across the rift where this emerges on the cliff face. The rift forms a huge gully the height of the face, bounded by a north wall forming an aright resembling in profile the bow of a WWI battleship, if the missing middle section is ignored. The top of the gully is bridged by a block, forming a skylight.

Good climbing ability is needed, at least on the part of the leader, who may then lay 150 ft (50 m) rope doubled for return around a 10 ft (3 m) expendable rope or tape tied around a suitable boulder. The climb itself is mainly on very steep earth, with few holds and less protection, becoming nearly vertical for the last few feet. The entrance lies among the lowest boulders. Remove any old slings you find there.

The rest of this description is by A.J. MacTavish (ex-HSCCF, the original explorers).

The entrance ladder pitch is 18 ft (5.7 m): belay to the boulders. Once inside, one can go back under the entrance slope for 30 ft (9 m) to a small chamber. Forwards, the rift goes for 40 ft to a scramble turning into a 33 ft (10 m) vertical climb up boulders. These are unstable: great care needed.

At the top is THE CATHEDRAL, a fine rift chamber at a crossing rift. Left is MARTIN, pushed for 40 ft by one of that name, who returned in a gibbering state. Right is PANIC CRACK, 50 ft to a turn back towards the cliff face. Beyond is a platform and a sandy floor is visible 12 ft below. The whole of Panic crack has to be bridged with occasional footholds; good exercise for muscles and nerves.

The main rift continues past a huge flake with no visible means of support, for 60 ft to a left turn over a dodgey floor. Various people have investigated the cellarage and returned speechless. Proceed to an obvious window in flowstone. Either ladder down 40 ft (12 m), or bridge across for 200 ft (60 m) to a window in the cliff face, too high up and too loose to do anything about it. This point is a few yards north of Hopeless Hole (*q.v.*), passing below with voice contact. (MacTavish, A.J. pers. comm.)

Cooper and Solman (1983) show this cave, with Gemini Rift which it embraces, as part of the cliff-retreat mechanism. Both caves are parting off huge slices of rock, following the example of an earlier rift whose stalagmite traces adorn the cliff face here. One doesn't dwell on this when in Steve's Endeavour....

SUNSET CAVE (Verne: Admiralty Quarries) Possibly now lost. SY6925 7295 L40ft (12m)

Obscure entrance in ivy-covered old quarry bank west of track north-west from parking area at the top of Incline Road (NGR 699 727 north. of Young Offenders' Institution) to Verne. Access road is a hidden

left turn off Grove Road just west of the churchyard, leading between high walls and known as 'The Hole in the Wall". Both road and track are signed Public Footpaths. Alternatively walk south from Glacis (see Verne locations).

Short, easy crawl/stoop ends abruptly at west 'entrance' high in wall of recent quarry. Most northerly water worn cave so far known on Portland; also highest stratigraphically, formed in Roach Bed but with small aven into Dirt Bed above. Notable eroded rock. The cave is currently threatened by quarrying.

TAR STALACTITE CAVE (Grove)

Churcher, Butler and Bartlett (1970) describes "7032 7226 .... a short cave, easily confused with Flagpole Rift, with low crawl 15 ft. to a chamber. Very loose.". Yet their heading for it gives 7032 7239 and refers to (Ford and Hooper 1964), which seems to describe a then un-named Rumble Chasm (*q.v.*)!

This illustrates the paucity of records by the original local explorers. Nobody now knows quite which cave was Tar Stalactite!

THE HEADS (Verne) 6958 7345 L.10 ft (3 m)

Tiny rift cave in south wall of Verne Ditch, marked by boulder bridging entrance. Heads is Navy slang for toilet - which is not a suggested use for the cave.

THRUTCH CAVE (Grove)

Now usually called Fossil Cave (*q.v.*).

TOP HOLE (Verne) 6920 7308 L.50 ft (16 m)

Short, rubbishy cave, possibly a fissure modified by percolation water. A set of small rift chambers separated by muddy crawls, used as a children's den.

TOP HOLE (Westcliff) 6799 7126

Name given by (Churcher et al 1970) to "small, short, loose, rift"; probably either Sharbutt's Rift or Sharbutt's Two Rift. Neither Sandy Hole nor the full depth of Sharbutt's Rift were known at the time. There is a slight discrepancy in Grid References. The name disappeared years ago, but is listed here to tie in with these early papers.

TWIN POT CAVE (Inmosthay) 6890 7238 L. 25ft (8m) approx.

Lost

WHITE HOLE (Bill)

See Bill Sea Caves

WHITE RIVER CAVE (Grove)

Lost

WINDY DIG (Westcliff) 6795 7062 L.180 ft (55 m)

Slightly alarming approach is path down grass slope descending from cliff top, which seems to end in a Suicides' Leap, but in fact turns back north into a gully formed by the rift breaking out on the cliff face and bridged by a prominent rock cube. The entrance is a small hole at the top of the gully, behind and below a boulder on the right of the path. The gully gives an awkward access to the under cliff.

Narrow slot drops 6 ft (2 m) to a muddy slope. Ahead ends choked, but an awkward climb up through a false floor (rope advisable for return) 10 ft above gains a perched boulder chamber. Slide down and crawl forwards to a short drop to a pitch head. (Care: formations.) M8 anchors in place, or tether back to boulders etc., 20 ft (7 m) ladder to steep mud slope. The rest of the cave is pure Portland rift: chimneying and climbing on greasy walls, until the rift becomes too tight.

There used to be a large, blood-red, stalactite over the crawl, the Sword of Damocles. Some time around 1970, this was stolen (possibly by a group of visitors known to have spent a week on the island, removing a lot of formations and breaking more).

YEOLANDS FISSURES (In quarry between Easton and Grove)

Lost

Cave locations

Portland is divisible into six areas, by both cave and roads layouts, arranged here in north-south order, with brief road directions. The roads are well signposted and the majority of the caves are reached from definite tracks and paths (though the under cliffs are rough going). To locate an individual cave, read through the heavily-abbreviated Area description specified by the cave description. This avoids duplicated route instructions. Refer to Map 1 for road names and major features and car-parks (labelled P.), some of which are simply roadsides or rough lay-bys.

These directions refer mainly to caves still accessible at time of writing (June 1993). The sites of lost caves may be found by reference to these notes plus the Grid References.

Area order:

Verne, Inmosthay, Grove, Westcliff, Wakeham, Southwell-Bill.

VERNE

Cross Verne Common by road east from the A354 by the hotel. Beyond viewpoint car park (P1) on left is football pitch right (south of road.): behind far, or south, goal area is small, shallow, rubbishy, ivy-clad quarry, just east of a pile of overburden. TOP HOLE at base of slope, on right among vegetation.

Road passes prison entrance. and car-park. Gated track in shallow cutting right close to prison gate is signed public footpath south to HIGH ANGLE BATTERY (information board at gate).

Follow Glacis road south from prison entrance for about 100 yards. Park in laybys (P2) on right (currently opposite radio station), above High Angle Battery cuttings (alternative access). For verne Ditch, follow ttrack east from road at 6950 7320 to cliff top path. Go south, descend to lower level close to Nicodemus Knob (rock pillar left by quarrying). Follow track back north at this level, almost to its end at a steel fence. On left, ascend into Verne Ditch. south wall of Ditch leads west past ADMIRALTY RIFT, THE HEADS, MAGAZINE RIFT. The first is in a collapsed gully in the Ditch wall, the last is at the head of the steep slope.

INMOSTHAY *(NB: this has been left for reference. The area has been totally changed by quarrying.)*

Park just off Wide Street, in Trade Croft trading estate entrance. (P3). Cross to lay-by opposite, serving a scrap yard.

Track to quarry, from north end lay-by (6868 7231), gated against vehicles. 1st track left (north) to isolated field, Fancy's Beach. A little before field gate, go left to grassy quarry terrace. DEVIL'S SLIT is obvious entrance in slatt (rubbley) beds facing you (i.e. in north face of old quarry, below field edge). Scramble down right into dank corner below field gate: DEVIL'S HOLE on right, ENGINEERS' HOLE ahead in north face.

Continue main track from lay-by, round SE corner of rubbish-filled quarry (site of HORSESHOE HOLE in NE corner). Track leads between high waste stone banks, to open area fronting deep, narrow pit. Cave fragments left by quarrying obvious on north wall, opposite. Dig for SAWMILL CAVE is in corner at end of half-tubes.

THE GROVE

From hotel at top of hill take A354 Easton Lane south, then Grove Road (6920 7215).

Small lay-by (P4) on right between football pitch and houses. For HIGHER HEADLANDS QUARRY CAVE, take track south past pitch, bear left, east to old quarry. Follow upper terrace to narrowest part of cutting, bridged by block. Scramble down to left, go round corner and across rubbish to entrance, down on left in a corner immediately before cutting degenerates to overgrown ascending boulder slope.

For FOSSIL (THRUTCH) CAVE, follow track signed Public Footpath behind houses, roughly east, to end at quarry behind sheds. Scramble down pack wall behind right hand shed, diagonally opposite obvious cave entrance in quarry face.

For the cliffs, follow Grove Road to cliff top lay-by at end of public highway (P5): unauthorised vehicles prohibited beyond sign, but road is open as signed public footpath to Verne. Use this, or an earlier, lay-by. Do not park on triangular gate approach opposite - emergency vehicles entrance. The signposted car park is primarily for Young Offenders Institution officers and visitors, but seems to be usable generally, at quiet times anyway.

At north end main lay-by (with stone tower), signed public footpath descends through gateway (ultimately to railway and beach). LOOKOUT RIFT is walled entrance in cliff left, under road. Tr as signed public footpath breaks out of short cutting, down step, double back south along base of cliff: KIDDIES' CAVE is in corner below lay-by.

At south end of lay-by: walled, overgrown enclosure. Hop over wall using convenient rubble-filled oil-drum as step. Path leads between brambles and giddy drop to head of a gully. Left of gully head: fragment left by superficial quarrying. Right above gully wall, ALLOTMENT DIG runs in beneath road. Gully descends to hump (Allotment Dig spoil heap!). COFFIN HOLE is left steeply down flank of spoil, back north, just round corner of cliff base, at ground level (below enclosure).

Back on main path, follow under cliff south from spoil tip. Rock step up to foot of steep earth slope: large entrance above is GUANO RIFT. Path crosses slope, south again, round another corner to another earth slope rising to easy short climb on cliff to FLAGPOLE RIFT entrance. Immediately south of Flagpole entrance is steep, ivy-clad bank: SKITTLE ALLEY RIFT above south corner of bank, in inner cliff corner.

Path ends further south, under ex-Coast guard lookout. Just before this, choked rift in cliff, with large boulder above forming chimney to overhang is GROVE CLIFF FISSURE. RUMBLE CHASM is in cliff-face next to distinctive masonry turret on cliff. In cliff at right-angles, facing north, is RAIL RIFT. Both caves are at similar high level and may be reached from here or from above, depending partly on climbing ability.

Alternatively, for Rail Rift then Rumble Chasm: Where Grove Road first meets cliff, walk past clubhouse and Y.O.I. visitors' car park. At a stone vent tower similar to that at lay-by P5, climb very carefully over wall onto vegetated area level with top of wall. Look where you are going: get it wrong and you may fall a long way.... Grassy gully descends to large ledge facing north, Rumble Chasm visible. Slot in ledge is narrow top entrance to Rail Rift, use this cave to approach Rumble Chasm. (M8 anchor low in wall at foot of Rail Rift for line). The whole area is very exposed with nothing reliable underfoot. Not a spot for the acrophobe!

Signed public footpath leads south to Church Ope Cove, via broad ridge between cliff and quarry, from which path descends cliff to old railway (and huts and crane at Durdle Pier). Shortly north along railway, short, bouldery DURDLE RIFT is seen in NNE-facing corner, above a loose climb. Pick route up vegetated slopes from track, to base of cliff itself.

WESTCLIFF

Westcliff contains the island's most important caves. Turn off Weston Road onto parallel access road for Westcliff housing estate. (6856 7141). Take Westcliff Road, turn left at T-junction onto Grangecroft Road, to car park P6 adjacent to playground. In February 1992, a private parking notice appeared close to the end house. It is difficult to see what if any legal authority this may have, but for diplomacy, park well away from the houses and neither obstruct nor disturb anyone. A gate enters meadows. Walk out to the cliffs.

Do not attempt to drive along the private track from the cemetery to Blacknor Fort. There is neither parking nor turning space, though it is a public footpath. Better, use the signposted car-park on right roughly opposite Church Ope Road.

WINDY DIG: south along cliff from car park, and 200 yards beyond line of stone blocks across cliff path at junction with track from east, is scramble down grass slope from edge (also 40 yards south of concrete manhole cover in signed public footpath).

Shortly NW from playground, is path into cliff top Sharbutt's Quarry. Path ends at short, slippery climb down quarry corner. Narrow rift at base is SHARBUTT'S RIFT. Out along quarry face towards gap at end of massive block wall is wide SHARBUTT'S RIFT TWO.

Follow main face (with flowstone) south, through small arch, to end of quarry. Descend short, steep gully, then back round corner, follow cliff north to SANDY HOLE, some 10 ft up face, directly below the Sharbutts 2 corner. It was once possible to struggle north to the Blacknor path, but the 1990 landslips practically stopped such adventures. However....

SHOWERBATH CAVE is nearer Sandy Hole than to the other caves north, across slips. It is safer to descend almost to beach level from Sandy Hole then climb back up. Landmark is site of wet-weather shower bath (from field drain) in shallow groove. Just north, cave is at rear of rock ledges, hiding it from below and is a small T-section passage.

For the rest of the cliff caves, walk north to the old Fort, then between fort (now private houses) and edge. Stakes and a ring bolt on the edge mark the BLACKNOR HOLE pitch. A few yards further, is the in filled entrance to OUTER LEFT TWIN CRACK. Fort bank curves inland to head of slope to lower level: at corner is cleft outcrop of PERSIL RIFT entrance.

Signed public footpath descends to lower level, passes Ack-Ack gun foundation. On cliff edge opposite cutting into old quarries, are 2 short scrambles down to grassy slope, the only route down here. Episodic path descends slope and along higher reaches of under cliffs, south-wards.

Foot of Blacknor Hole pitch is marked by an elder bush: the cave entrance is invisible from above or below. A little further, the cliff cuts back and QUEEN'S ENTRANCE of Blacknor Hole is seen, below an overhang, above very steep grass slopes. Continue south, path eases on grassy terrace leading to prominent toppled stack (remains of rift wall: flowstone on cliff). Near north end of terrace, choked fissure is north end of Steve's Endeavour Rift, then at cliff foot is HOPELESS HOLE.

Pass inwards of stack, move round next corner over very steep earth slope (care!). GEMINI RIFT is next, above shallow gully in vertical face (rock climbing techniques needed). Further south, above steep scree slope, is huge edge with distinct angular block missing, forming north wall of very steep gully up to boulders hiding STEVE'S ENDEAVOUR RIFT entrance. Looking up, a skylight behind a bridging block is a useful marker. (This is just south of old lookout on cliff top, suggesting abseil route in; beware of loose boulders. Not tried as far as is known.) This point is just accessible from Sandy Hole, by rounding the landslips at beach level. Take care on these treacherous slopes. FERRET'S ENTRANCE (Gemini Rift) is a little north of Steve's Endeavour, about 20 ft up the face, at head of steep sloping ledge.

WAKEHAM

Drive (or take bus!) south through Easton, down very wide Wakeham Street (legacy of rope-walks). Signposted public car-park on right, just past right-hand bend by Portland Museum (P7).

CHERTY RIFT: use path east between house and north end of old railway bridge (6960 7133). Locate route through quarry to intact track-bed at 6995 7141: the cave is on the face above the track, facing SW, above boulder ramp.

RUFUS RIFT: take road and signed public footpath to Church Ope Cove. Do not drive down road; narrow access to houses only. The fissure is in cliff below ruin, at side of signed public footpath as this broadens onto viewpoint area.

ST. ANDREW'S WELL: go down steps towards beach. At sharp left turn, narrow path ascends right past old walls to church ruins. Go right into bushes just before gateway, well is at foot of cliff near path.

SOUTHWELL - PORTLAND BILL

Entering Southwell from Easton, turn left onto small parking space by gated track to cliffs, immediately right of drive to isolated cliff top Chene House (P8). Do not obstruct either house or track.

RED DOOR TUNNEL is below Chene House on the cliffs at 6915 7025: walk down to cliff south of house, just south of junction with a track descend from start of road to the Bill, descend to beach via slope carrying old pipe and go north along beach .

The sea-caves along this cliff (LIMEKILN CAVE, SAND HOLE, CAVE HOLE, etc.) do not merit special individual trips, but are features on a scenic/geological walk. Follow cliffs south from Freshwater Bay, past old quarry. At concrete monoliths about 100 yards before first fishermen's crane, signed public footpath descends almost to beach level. Go north along beach about 50 yards to corner containing SAND HOLE'S slightly-obscure entrance. CAVE HOLE is south of the cranes, its blowhole is in depression close to cliff edge. Next, sprawling beach-huts announce the approach to Portland Bill, the south tip of Portland. A small quarry near the first huts exposes some too-tight phreatic tubes.

PULPIT RIFT and WHITE HOLE are easy to find. Walk along the cliffs NW from the lighthouse to the obvious Pulpit Rock stack: Pulpit Rift is in the terrace in front. White Hole is in the headland further NW, follow Admiralty enclosure fence to start of Raised Beach formation, scramble down to terrace in corner above entrance zawn.

The Bill cliffs are riddled with sea-caves, virtually all unrecorded. Most are visible and accessible only from a boat.

NOTE: The only legal public parking anywhere from Southwell to the Bill, is the Pay-and-Display car-park at P9.

PARKING AREA GRID REFERENCES

P1 - 690 731

P2 - 695 733

P3 - 686 724

P4 - 695 723

P5 - 703 724 or 704 721

P6 - 681 712

P7 - 696 712

P8 - 691 702

P9 678 685 (pay and display)

The lost caves

This rather sad chapter details the caves lost to quarrying or back filling. For various reasons, little has been done to try to save any caves, although if any of Portland's most important caves were ever threatened, then appropriate action would be taken. (The most important sites are in surface SSSIs.) We may take some comfort from the very quarrying which destroyed the caves, having revealed them in the first place. Also, the dimension stone has been used for some of the country's finest architectural and sculptural creations, as further consolation. The same could hardly be said of road aggregate, though!

Note: A few of these caves were still open at time of writing, but were fated to be quarried away or buried. The Inmosthay and Wakeham railway-cutting areas were changed totally by 2016, losing previous land-marks and all traces of anything of speleological interest.

ARC RIFT (Southwell) 690 705 approx. L. 200 ft (60 m).

Narrow, shattered, well decorated fissure exposed in the rapidly-changing Coombefield Quarry.

AUSTRALIA RIFT (Wakeham) 699 714. L. 140 ft (43 m) VR.70ft.

Was in the north wall of Wakeham railway cutting. Tatty old rope showed local children played in the entrance. The cave guarded its depths by a vertical squeeze onto a deep chimney. A roof grotto called The Boudoir was notable for a carillon of beautiful yellow stalactites. The cave was buried in September 1976, then the area was re-quarried, changing everything.

BOWERS RIFT (Westcliff) 695 718. L. 220 ft (67 m)

Impressive fissure with flowstone-coated walls, exposed and removed by quarry. Reported as containing a committing chimney ascent to a fine grotto and a bedding-plane opening into a parallel rift. If these are mass-movement rifts, the bedding-plane feature defies adequate explanation.

BULLSEYE FISSURE (Westcliff) 6817 7170 L. 15 ft (5 m)

A quarried fragment of the St. George's Rift fissure. Named after an old lantern lens found at the entrance, it offered no sport but was richly decorated. Buried, along with St. George's Rift, in Summer 1988.

CHERTY RIFT (Wakeham) 7009 7154 L.180 ft (60 m)

Entrance some 40 ft above the disused railway track-bed, reached by scrambling up boulders spanning an outer remnant of the fissure along the cutting wall. A steep descent ended at a short, awkward drop below a jammed boulder. Across a hole (to lower series), a false floor ended before the rift pinched out.

Chimneying down reached a lower level back to climb up through earlier hole: short, moderately sporting trip.

CITRUS RIFT (Wakeham) 6985 7136 L. 30 ft (10 m) estimated

Shattered fissure in South wall of railway cutting, near Australia Rift, whose fate it shared. Named after its yellow flowstone.

COOMBEFIELD QUARRY (Southwell) Around 690 704

This quarry is notable for the number, lengths and speleothem quality of the major fissures it revealed over the years, such as Crocodile Canyon, despite being some distance inland from the cliffs. The present operators back fill the workings soon after stone extraction is completed.

CROCODILE CANYON (Southwell) 6905 7049 L. 90 ft (27 m)

Spotted in working Coombefield Quarries by DCG, who surveyed it and named it after a toy crocodile found nearby. The very well decorated rift ended at a stalagmite blockage. Revealed and removed by quarrying.

DEVIL'S HOLE (Inmosthay) 6880 7236 L.120 ft (40 m)

Roomy, triangular phreatic passage ending cut and choked by in filled quarry, may have been linked to Engineers' Hole, Sawmill Cave and New Passage, though probably not the Grove phreatics (as was suggested within DCG and HSCCF).

DEVIL'S SLIT (Inmosthay) 6877 7238 L.80 ft (22 m)

Short, difficult rift with obvious traverse line from entrance level and greasy, tortuous lower reaches. The quarry itself may have been called Devil's Hole. At one point quarrying removed the fissure's West wall, showing it to have been far longer than the enterable section.

DOLPHIN RIFT (Wakeham) 6927 7097 L. 75 ft (23 m)

Rather sporting, muddy rift once containing The Dolphin, a large stalactite resembling the animal, stolen sometime in the mid-80s. The cave was buried by back filling in Spring 1992.

ENGINEERS' HOLE (Inmosthay) 6880 7237 Dig

Roomy, chert-roofed, silt-choked phreatic crawl, dug to about 20 ft long c1974-6 DCG, spasmodically by YAC / WCC since. The cave was almost certainly at one with Devil's Hole alongside. Its DCG excavators were also local model-engineering society members, inspiring its name and a satirical poem in the *DCG Journal*.

GLOW-WORM RIFT (Southwell) 6910 7045 L. 150+ ft? (46+ m?)

Impressive Coombefield Quarry rift. From the entrance, typical descents and ascents over jammed boulders and holey false floors led to an attractively decorated section ending completely choked. Location indeterminate by 1991. The Glow-worm was seen in grass nearby, after an evening trip, by the cave's explorers.

GRAY'S CAVE (Inmosthay?)

Cited by Ford and Hooper (1964) thus:

Gray also recorded [together with details of the fissure caves and their bone content, etc. and the drainage to springs] a grotto 30 feet by 12 feet in Freemans's Quarry near [St. George's] Church, with hundreds of stalactites and ornamental columns. This may have been the cave known as a 19th Century attraction, now lost completely.

Ref. Gray, W., 1861 On the Geology of the Isle of Portland. *Proc. Geological Association*, Vol.1 (7) pp128-129.

HORSESHOE HOLE (Inmosthay) 6890 7239 L. 20 ft. (7 m) approx.

A low, wide phreatic oxbow, probably once linked to nearby Devil's Hole, etc. The entrance became buried under fly-tipped rubbish, then the whole area was subsequently quarried away.

JEWELLER'S RIFT (Southwell) 6910 7050 L. 60 ft (20 m) approx.

Beautifully decorated rift in east wall of Coombefield Quarry. The entrance climb became a short pitch as work modified it. A stalagmite slope up to an eye hole girt with orange formations introduced a drop (great care needed) into arguably the finest grotto on the island, with very long orange and yellow straws. A short crawl under a stal barrier entered a yellow flowstone coated fissure which appeared to have held an 8 feet deep gour pool; dry when first explored.

The first stal barrier, and a fine little grotto in the roof above, lay beyond the quarry boundary, so the best part of the cave may survive. Blasting shock is rapidly attenuated with distance, so the walls of caves like this often escape serious damage, though delicate straws might not stand the vibrations. Sadly, burying it again was probably a kindness.

LIEBHERRSCHACT (Wakeham) 690 719 approx. L. 45 ft. (14 m)

Short, rather plain, muddy rift in quarry face below Weston Street. Its entrance was an awkward 12 ft pitch, which had to be partly filled in to prevent the ladder jamming in a crack! It was "discovered" by quarrymen using an impressive rock-drilling excavator made by Liebherr, hence the name.

NEW PASSAGE (Inmosthay) 6892 7244 L. 125 ft. (38 m)

A fine, joint-controlled phreatic passage entered at two points in a quarry wall. Of walking height, though fairly narrow, with clean-washed, scalloped walls, it probably once linked with Sawmill Cave etc. By January 1989 the cave's location quarry had been unrecognisably back-filled. The entire Inmosthay area was quarried by 2017.

OUTER LEFT TWIN CRACK (Westcliff) 6792 7168 L. 40 ft (13 m)est.

The entrance lies below a concrete slab on the cliff edge near a bench-mark stone in front of the Fort. Originally, a small hole inland of the slab approached a 40 ft pitch, the entire height of which was open to the cliff-face a few feet away! The rift is solidly choked with earth and rocks under the Fort bank, which is just as well, since it is probably part of Left Twin Crack (Blacknor Hole) but appeared to take a septic-tank overflow, giving an occasional whiff of sewage. The cave may be still be enterable by exposed manoeuvres on the cliff, if you like high things....

P155 (Wakeham) 689 709 approx. L. 50 ft (15 m)

Un-inspiring, narrow, deep, greasy fissure in north wall of Suckthumb Quarry. The name played on the initials P.I.S.S., its discoverers (a small local group who failed to leave any written records).

PERFIDY CAVES (Grove) 6945 7240 L. 150+ ft (50+ m)

Well-developed set of phreatic passages intersected and destroyed by quarrying. They lay in the Roach, the preferential solution effects on this rock being strikingly displayed in places, making them fine examples of their category. This part of Portland seemed to specialise in shallow, joint-controlled, percolation- water caves in the Roach bed. Perfidy Caves and numerous enlarged, partly-silted joints around the same quarry were fairly recent discoveries complementing the Leicester University work (see Geology chapter).

PERRYFIELD QUARRY RIFTS (Easton) approx. 692 713 Lost

Sizeable slip-rifts. One, a gully (NNE-SSW direction), must have been some hundreds of feet long, as it was cut into two parts left in the north and south walls of the quarry. The two fissures ended in chokes, the southerly being well decorated with unusual stalagmited mud-pillars. We cannot explain the presence of such large rifts parallel to, but about half a mile from, the nearest sea cliff, unless they are solutional caves. The expected solutional features, however, are lacking.

SAWMILL CAVE (Inmosthay) 688 725 (north entrance.) L. 429 ft (132 m)

This was the largest fragment of an extensive phreatic system dismembered by quarries in this part of Portland and contains many of the local characteristics, plus some good formations. One of its earliest explorers was probably a quarryman; J. Stone 1928 was inscribed on a passage wall. The following summarises the Leicester report.

The cave was entered between boulders (now buried) and roomy passage followed a prominent joint. Various cross-joints occurred and the passage zig-zagged. Of the few real side passages, one contained an attractive grotto. A large block partly obstructed the passage at one point, with no clear indications of its origin. It may have dropped from the roof.

Titanites Turn showed good casts of the ammonites (*T. giganteus*), then the first boulder choke occurred. J. Stone's inscription was just beyond the choke: he had probably entered the south entrance. The passage continued generally south, becoming boulder-strewn, to a second boulder choke. Beyond, the central, longitudinal constriction, a notable feature of much of the cave walls, pinched in to support debris, forming an 8-section for a time. The cave ended at a South entrance, a squeeze between boulders in a disused quarry at 689724. Cut-away bits of passage were on the face nearby.

The south entrance was lost, but in the 1980s, was thought worth re-opening Sawmill Cave and if so, protecting against casual visitors (non-cavers) and quarrying (by SSSI?). This did not happen.

SAINT GEORGE'S RIFT (Westcliff) 6817 7170 L. 160 ft (49 m)

This sizeable rift was in the south-east corner of a long-disused quarry and seemed safe, but was buried by back-filling in Summer 1988. (A plea to save the cave was too late; unfortunately for several bats roosting within, unknown until too late). The site is now unrecognisable.

The entrance was a broken 40 ft pitch walled by accumulated quarry debris and illicit domestic rubbish piled against the quarry face. Part way down was a tight alternative entrance spiced with corroded scrap iron. Across a crystal pool of varying depth were assorted stal constrictions and short traverses until the rift became too tight.

SILKLAKE QUARRY FISSURES (Easton) 6973 7165

In 1863, T. D. Allen opined in The Geologist that as the mammalian remains in these fissures were below Lower Purbeck beds roofs, they must have weathered out from the Portland limestones! He maintained this view, rather acrimoniously, in the face of Pengelly, Fisher and Jecks and others pointing out that such fauna as Man and Mammoths, did not roam around Jurassic sea-beds.

In 1953, Stopes, Oakley and Wells found scattered bones and hammer stones in sludged early Bronze Age material in these rifts. Remains included man and domesticated animals. The rifts were removed by 1964. (Ford and Hooper 1964)

TAR STALACTITE CAVE (Grove) L. 60? ft

This enigmatic cave is listed in earlier work on the island's caves, but defies identification. Probably an early name for one of the Grove Cliff group, though its description depends on whose work you read and seems to tally with nothing now known.

TWIN POT CAVE (Inmosthay) 6890 7238 L. 25ft (8m) approx.

Roughly above southern end of Sawmill Cave (lost; q.v.) in the corner of a terrace in the face of the old Quarry.

Water worn passage passed impassable side passages and opened into small chamber on junction with impassable 'inlet'. Ahead narrowed and choked. Floor cut down into narrow, choked pot divided by a flake. The right hand pot floor was the chert seam in the roof of a lower-level passage remnant in the adjacent quarry face: the Sawmill and Engineers' horizons? Puncturing the chert revealed... more silt!

Other geological features were apparently vadose features, the first found in Inmosthay and Grove caves and possibly misfit; and homogenous sediments lacking varves seen in Engineers Hole (q.v.).

Dug spasmodically, 1990s, and systematically 1994, WCC/Ind., in hope of re-opening Sawmill Cave. Above description as at December 1994.

WHITE RIVER CAVE (Grove) 6951 7239 Dig

The entrance, surrounded by an artificial depression in in-fill, was in a quarry face fronting Grove Road, the cave crossing below the road.

A small tube entered larger cross-passage, but the main continuation was roomy water-worn passage to a dropped slab barring progress, with an open view beyond.

Local diggers set to work (M. Dewdney-York et al). With no warning, and ignoring the cavers' protests, the masonry firm operating at the time started pouring stone-saw waste into the depression, filling the cave with white slurry. The site was a shallow hollow floored with white limestone paste for many years, then levelled in 1988. In 1990, permission was sought to find the lagoon, then to exhume the cave. Despite the site being well away from the present quarry operations, and the interest shown by the local manager, the London-based owner refused with no explanation. (hence Perfidy Cave....)

The cave was also known as ROBIN HOOD'S CAVE. If anyone ever recovers it, the original explorers' tools are still in there.

YEOLANDS FISSURES (around 700 718)

Rifts found and destroyed in Yeolands and Broadcroft Quarries. One was said to have had an entrance pitch of 40 ft, averaged 45 ft high, was some 100 ft long with a level floor and richly decorated, including an orange stalactite some 10ft long by 2ft diameter.

These quarries have breached rifts filled with breccia containing bones of assorted species and ages including Pleistocene fauna.

The geology and caves of Portland

Abstract

Portland's limestone geology has controlled cave development in three distinct ways (sea caves apart). The Westcliffe system could have been swallet-fed, but the Grove Roach-bed caves were probably entirely percolation water drains initiated by aragonite dissolution. At least two active phases occurred. The mass movement caves all post-date the karst caves and show typical features. We have combined our observations with others' studies for this work.

Introduction

The Isle of Portland is part of the Weymouth Anticline, related to the Purbeck Anticline, a major fold in the upper Jurassic/lower Cretaceous deposits of South Dorset. The Dorset coast illustrates a wealth of text-book geological features, but here only the cavernous limestones are examined.

The karst caves lie in the Portland marine limestones and pre-date the separation of Portland from the mainland. The lower passages, unusually, follow insoluble chert or thick clay roof horizons, but otherwise seem to have been swallet fed phreatic-vadose stream ways, the higher caves follow joints in the Roach, originally an aragonitic limestone, in which freshwater dissolution without replacement of the aragonite led to conditions favourable for complex horizontal mazes of phreatic passages to form. Varied, so far little-investigated, sediments suggest at least two phases of high stream flows, separated by sediment deposition.

By the end of the Pleistocene, Portland had become an island, the karst caves had become fossil and the mass movement caves started to form - and some are still developing.

Note: the term 'cave' in this chapter, refers to natural cavities of any size, whether enterable by humans or not.

Geology

Portland's rocks form a conformable sequence, with no large folds or faults. The beds dip southwards at $1^1/_2°$ average (Fig.1). The strata summary presented here (Fig.2) uses Arkell's (1933) section and bed names (from the stone trade), helpful for placing the caves stratigraphically, although the strata are not consistent across the whole island. The names [in square brackets] are by Townson (1975), who analysed the depositional conditions and used Purbeck locality names (!) for Portland Beds, formations and Members. He also removed individual unit names.

Kimmeridge Clay, over 400m thick, exposed at the north end of the island only, underlies two marine Portland Beds formations. The lower is the Portland Sand formation, comprising fossiliferous mudstones and dolomites, best exposed at Clay Ope (Westcliff). Above the Sand is the massive Portland Limestone formation.

The thin, hard, fossiliferous Basal Shell Bed [Portland Shell Bed] is best seen at Westcliff (Cox 1925). Exposures of the contact with the Portland Clay show overhangs and seepage.

The thick Cherty Series [Dancing Ledge Member] is notable for its evenly-distributed nodular and tabular chert, derived from abundant siliceous sponge spicules (Townson 1975). Normally the chert is

horizontally bedded within the limestone, but a limestone band with distinctive vertical chert-filled joints occurs in parts of Westcliff. A major chert band 3-4 inches (75-100 mm) thick has influenced the development of some caves.

The Portland Stone [Winspit Member] comprises a series of named limestone beds (Fig.2), described below.

The Base (or Best) and Whit Bed oolitic limestones are the 'Portland Stones' of the architect and mason. They are creamy-white and fairly soft when freshly exposed, but harden and darken slowly with weathering. They are homogeneous freestones, being easily cut in any direction, with few intact fossils or other impurities.

Above the Whit, often with no visible parting, is the Roach, whose abundant shell moulds give it a spongy appearance. This belies its toughness and resistance to weathering, which make it suitable for heavy structural work, rather than fine masonry. The Roach is the highest marine rock in the sequence.

The Purbeck Beds [Purbeck Group] are brackish to freshwater deposits, known in the quarries as Caps. The Lower and Great Dirt Beds are fossil soils.

The main Purbeck limestone on Portland is the Top Cap, which is fairly hard and commonly contains tubular tree-branch moulds, falsely resembling miniature phreatic tubes.

The Soft Burr, Aish, Bacon Tier and Slatts are thinly-bedded, flaggy limestones. The Marl is a creamy-grey mud, possibly an insoluble residue of the limestone.

Many of the dissolutional caves contain distinctive ginger-brown, gritty, water lain sediment, with assorted pebbles and scattered ironstone fragments. These deposits may be related to the Tertiary deposits elsewhere in south Dorset, although many of the pebbles, mainly chert, are local. Ironstone occurs on the hills above Abbotsbury, but was found commercially unusable.

Recent deposits include the Raised Beaches and Head at Portland Bill. The Raised Beaches are pebbled bed with a very thin calcareous binding, dating from previous interglacials in the present Ice Age. The Head is solifluction material: like Mendip and the other southern English hills, Portland was not glaciated, but would have been subject to periglacial freeze-thaw processes in tundra conditions.

Fossil remains are varied and locally impressive. The Portland Sands fauna includes the *Exogyra* (oyster) Beds and the large Glaucolithites ammonite. The Portland Limestones up to the Whit contain bivalves (oysters etc.) and *Titanites giganteus*, the largest of the ammonites. These grew up to a metre in diameter, leaving the massive fossils which have inspired many organizations' logos on Portland and in East Dorset.

For many years, the quarry firms sold ammonites as ornaments. Some ammonites, when sectioned and polished, reveal beautiful internal structures, with chambers full of crystals. Usually, however, the interior of the fossil is just limestone. Sadly, some quarry managers now regard ammonite recovery as uneconomical, so into the aggregate crusher go the fossils, with the bedrock. A most ignominious end for such a splendid beast's mortal remains, having come unscathed through so many millions of years of active geology, only to become motorway or supermarket hard-core!

The Roach is a mass of *Aptyxiella portlandica* ("Portland Screws", to the quarrymen), a spiral-shelled gastropod and *Laevitrigonia gibbosa* ("'osses' 'eads"), a small bivalve. Both are usually preserved as moulds, since the original aragonite shells were more soluble than calcite. Usually, the limestone is compacted and the aragonite replaced by calcite, the latter process requiring considerable volumes of water and many tens of thousands of years. The Roach in the Portland formation, however, is uncompacted and has lost, but not replaced, its aragonite (West, 1983). The rock therefore retains much of its original porosity.

The Purbeck Bed's noted fossil tree remains include large bole casts, *e.g.* above Sharbutts Two Rift, and sizeable chunks of fossil trunk. Good examples of these and other local fossils are displayed in the grounds of Portland Heights Hotel and at Portland Museum. The best natural bole-cast display,

however, is the "Fossil Forest", near Lulworth Cove. An exposed ledge above the main face of Sharbutts Quarry, near the climb down into the quarry, displays very good tidal-shore ripple marks.

The accompanying map and general section (Figs. 1 & 2) show the geology and the commercial significance of Portland's rocks. Note that the sequence varies, particularly in relative thicknesses, around the area. The Portland Shell Bed finds itself back in the sea, thanks to the steady dip, from about Southwell southwards. Fortuneswell, Chiswell and Castleton all lie on the Portland Sands and Kimmeridge Clay, and on slumped material.

The Portland and Purbeck Hill limestone deposits, and their fossils, vary across East Dorset. The famous Purbeck Marble gains its appearance from masses of little *Viviparus* water snails. It is not metamorphic: marble here is a masons' term.

Weymouth Anticline

The large, asymmetrical Weymouth Anticline is aligned east-west across what is now the Weymouth peninsula and is one of a series of major late-Tertiary folds across Southern England. The whole fold plunges very gently eastwards, conforming with the regional pattern.

The northern limb dips at 15° against the long, high-throw Abbotsbury / Ridgeway faults. The latter fault affects the railway cutting between the A354 and the tunnel portal, at SY673852. The west wall of the cutting is a clay wedge left by phases of the faulting, but released to slump by the cutting. The steeper east wall's more competent strata finely delineate the fault seasonally, by an abrupt change of covering vegetation. Pick that out and the plane outcrop is the obvious break of gradient away east across the hillside. The major faults are paralleled by several others, plus local folds.

The main feature of possible speleological significance on the northern limb is UPWEY WISHING WELL, the source of the River Wey (SY661852). It discharges a million gallons per day on average, but in the extremely wet 1989-90 winter it peaked at about 14 mgd and water poured from all manner of satellite springs.

The spring is in the lower Portland beds, possibly at the clay contact and appears as a narrow fissure (between boulders?) and a smaller up-welling from sand in the Well itself. The original outlet may be obscured by the concrete path. The spring discharges Portland Beds material, including chert and fossil fragments; as well as Cretaceous-age Greensand from the Ridgeway Fault region. The flow responds rapidly to rainstorms and to automatic bore-hole pumps about a mile west, especially in summer, when water supplies have to be maintained despite lower ground water and a local population greatly augmented by holidaymakers.

The pumping surges are abrupt enough to have damaged machinery in the restored water mill 100m downstream from the spring. The mill has excellent flowstone deposits in the wheel pit and straws in the tailrace tunnel (no access, the mill itself was open to the public, but ceased trading in December 1991). In July 1991, the Wishing Well had to be rebuilt after collapse due to the stream undermining it.

Other Portland Stone exposures on the northern limb of the Weymouth Anticline exist, but no caves have been found.

The core of the fold is the Weymouth Lowland, crossed by escarpments of the more resistant beds including non-cavernous limestones.

The southern limb includes the escarpment separating Weymouth from Wyke Regis, its resistance to erosion having turned the River Wey east through the area now occupied by Weymouth Harbour and Portland. Portland Harbour occupies a Kimmeridge Clay basin levelled by the erosion.

The very gentle southerly dip, averaging $1^1/_2°$, helps to make the Portland water worn caves resemble those of the Yorkshire Dales. The passages are indeed strongly joint-guided, with definite bedding-

plane roofs which may be significant in the inception horizon context, if the bed above the bedding-plane differs from the one below.

Age of the Portland caves

Dr Trevor Ford collated studies of the regional geology by Sparks (1952), Reid (1902), Melville & Freshney (1982) and Jones (1980) and those by Ford, Hooper et al (1964) of the caves then known, to suggest the late Tertiary as the time at which phreatic flow commenced (Graham & Ryder 1983). At that stage, such flow would be very slow, probably driven by the hydraulic head of a former water-table above the present summit of Portland (over 150 m above present sea-level).

The Weymouth Anticline is at least 10 million years old and would have been covered by thick Cretaceous and Lower Tertiary strata, subsequently denuded from the crest but still existing north of Purbeck. Drainage from these may have been a source for the cave phreas.

The erosion of the ridge is considered to have started with large rivers draining east to the present Solent and with drainage south to the developing Channel. The caves show evidence of southwards flow; in any case, if they became vadose their streams would have been influenced by the southerly dip, (with a slight easterly component) and by the major north-south jointing.

The breaching of the Weymouth Anticline removed the catchment area for any Portland swallet-fed phreas, drying out the stream caves. This process was probably modified by Ice Age changes in sea level and water flows, but no definite dating has been attempted. Sandy Hole appears to have gone through a stagnant phase, when it may have become silted up, with water partly filling North Passage, followed by an active phase which washed the silt southwards. Sparks (1952) thought that by the early Pleistocene, Portland was separated from the mainland. We may assume the caves became fossil at or before this time.

The Leicester University researchers investigated only the Inmosthay and Grove phreatic caves, as the Westcliff ones were not yet known. The Roach Bed caves were described (Ford & Hooper, 1964) as developing by preferential dissolution of the aragonite, just below the falling water-table, in the early Pleistocene. The caves' decay after abandonment, when percolating water caused falls of angular blocks and deposited stalagmite, is shown to date from early-middle Pleistocene. The Raised Beach is of Last Interglacial age, when the sea-level was about 20m higher than present, still well below the altitude of Sandy Hole – which intriguingly, may extend below present sea-level beyond present explored limit!

This suggests the water-worn caves formed between 2 and 10 million years ago. More precise estimates would require such techniques as paleomagnetic tests on the sedimentary fills in the caves, which may add to understanding the surrounding area.

Cave development

Research by Ford, Hooper and colleagues (Leicester University / CRG); by Ryder, Cooper and friends (MSG); and observations by local diggers, are summarised. Recent research elsewhere, by Lowe, is applied to Portland caves. The caves fall into two categories: dissolution and mass-movement.

The dissolutional caves

These form three groups, according to strata and are by far the oldest caves on Portland. Ford and Hooper (1964) describe widespread phreatic networks exposed by quarries at Inmosthay and The Grove, as purely dissolution cavities with no swallets. Expected swallet-cave features are lacking, although passages have well scalloped walls, so water must have flowed along them. Many of these caves (Fossil Cave, etc.) are in the Roach, whose multitudinous fossils are aragonitic, which is more

soluble than calcitic limestone. The fossil moulds themselves would assist dissolution by presenting a greater surface area for attack. This was displayed particularly well in Perfidy Caves (now lost).

Recent finds support the Leicester work. New workings in Independent Quarries (north of Grove Road) exposed many dissolved-out joints. Most were impenetrable but some were sizeable passages (Perfidy Caves). Some displayed finely-etched Roach. Sufficient sediments and speleothems were exposed to suggest several stages of activity. The latter included fine calcite spar flowers implying calm pools, though these may have been purely local.

All contained the characteristic gingery-brown sediment. If the caves had no surface openings, where did the sediment come from and how did it enter the passages? (If it is not insoluble residue left by dissolution of the limestone. The most likely source would have been overlying beds, or the subsoil. The sediment would have filtered down from these through joints enlarged by erosion by ground water, so no discrete swallet streams were needed to transport sediments into the caves (Halliwell, pers. comm.).

The highest known phreatic cave, local dissolution effects apart, is Allotment Dig (Grove Cliff). Originally it was almost full of layered sandy sediment. It is isolated, although it may parallel Coffin Hole which is some 40 feet below and, curiously, free of sediment.

The pattern is repeated by Engineers' Hole, which once entered the roof of Devil's Hole. The upper cave has a rectangular cross-section and a chert roof and is full of stratified, barren, fine sediment. The lower, joint-controlled, passage of a triangular section with one wall deeply undercut, typical of the areas' phreatic caves, has apparently ignored the chert and has just a layer of sediment on the floor, originally banked into a central ridge.

The second category of dissolution caves is the chert-roof group, particularly Engineers' and Blacknor Holes. Blacknor Hole had become vadose. Its two entrance passages are uniform, low, rectangular-section crawls, below the main chert seam, as far as their respective crossings of Tangerine and C&A Rifts.

Beyond, the passages deepen, at nick-points hinting at things to come, much to the encouragement of the diggers! Still clinging religiously to the chert, they are almost walking height before uniting at The (assumed) Confluence.

A small, unmistakably vadose pot in the entrance to the Wriggle Push roof-tube has a cut-back upstream side and at its base, a small hole into the floor of the main passage where this vanishes in the Fairy Rift choke. Its smooth lip and walls suggest corrasion.

The main Ariel Tunnel continues south, still chert-roofed. The one exception is a short ovoid section, with several inches of limestone between it and the chert above. Read (its discoverer; pers. comm.) suggests that this was the true stream way form, the thin limestone ceiling having peeled away elsewhere. This is quite possible, as the passages are cluttered with angular blocks. However the chert is exposed even in the widespread anastomoses in the cave, including a network linking Ariel Tunnel, Fool's Paradise and cut by Grand Canyon.

The passage ends at the splendid, though short, vadose trench and down cut pot (Brownsea Island). The diversion into the latter is visible among the breakdown clutter. Only now has the cave left the original high-level chert band route, now veiled there by the Squezy Rift chokes. It dropped to the Brownsea Island "Dehydrated Sump" floor / Vortex Passage level, comparable to that of Sandy Hole (see survey). The vadose action is that traceable back to near Tangerine Rift, vindicating the diggers' efforts.

Until Blacknor Hole's 1986 Extensions, Sandy Hole still appeared to be in the first category of Portland's dissolution caves. Now it is considered part of Blacknor Hole, with intervening solid marl and collapse chokes (the passable link is a mass movement rift) but is still enigmatic. The east-west passages appear to have merely wandered in, meeting the main conduit by chance, though that is unlikely. The small Inkwell collapse feature has no definite signs of flow from one passage to the other. Moreover, Prize-Day / North Passage is a phreatic tube with a faint standing-water line and no link to Paul's Progress below. Only digging will show us its likely origin and any relationship with an east-going roof passage

off Paul's Progress. The World's End cross-passage may be a purely local feature: its Apathy section is chert-roofed, but Schitzenstrasse is in the next horizon down.

Sandy Hole forms the main example of the third group, roofed by a very thin mudstone between two massive limestones. The north-south passages of Sandy Hole look vadose but were probably sumped. Dr Ford (pers. comm., and (1964)) advises that the passage shape could arise from dammed-up percolation water attacking the walls once the stream itself had departed.

Summarising, we may see two distinct forms of cave. One set are solutional passages with no openings to the surface. The other (Blacknor Hole especially) is more akin to the upper series of many Yorkshire caves, having developed from sinks collecting streams - and sands - from land now long vanished.

So, first, where were the sinks? No definite features have been found on the present island surface, apart from a relict surface channel quarried away in the 19th Century - and any others quarried or built on without trace?. This contained large river deposits and lay somewhere at the Verne (Prestwich 1875). Significantly, gravely sediments and pre-rift dissolution pockets are found in some mechanically-formed rifts in the north and east of Portland.

Secondly, what did the chert band do? Mike Read's proposal is given above. Graham (1981) suggested that the chert formed a phreatic damp-proof course, preventing the water rising to its intended level, provided the chert band was impervious and unbroken. Thus confined, the water developed extensive anastomoses in the contact, before coalescing into definite passages. Although the brittle chert subsequently peeled away from cave roofs, this was a purely secondary effect and the limestone above is seen to have suffered only shallow dissolution, by percolating water (no scalloping).

Both cavers' ideas are broadly similar, begging the same question. Whether Read or Graham (or both?) is correct, insoluble passage roofs are not unique, but are most unusual. Normally, caves have the insoluble rock as the floor or wall, as Reeve (1981) shows in chalk with tabular chert. (Before suggesting phreatic passages may follow shattered zones within the rock, citing chalk and the Portland Roach-bed caves, but "at a loss " to explain it.) Shale bands are common and insoluble, but have quite different effects on cave development.

The effects of shale bands on cave development have been investigated in detail in Yorkshire, where extensive passages in many major caves in the Carboniferous Limestones follow such bands. Reading Halliwell (1977) reinforces the idea that shale bands and chert bands have quite different effects, even with similar band thicknesses and dip angles. The significance of such beds is undoubted, although the phreatic and vadose developments themselves for each cave must be accounted for.

Myers (1948) expanded on Simpson's (1935) theory, to suggest water originally flowed along the top of the impervious shale until it could find a way through to the limestone below, cutting this down by vadose action. Hudson (1933) and Sweeting (1950) considered water-table effects to be more important than strata, but Waltham (1970) returned to Simpson's and Myers' ideas. He added that once the stream cut through the shale on which it had collected and dropped down a joint or fault, erosion of the shale allowed rapid passage enlargement

This work all applies to the Yorkshire Dales caves. Could similar processes have applied on Portland? The chert resists erosion and is mechanically fairly strong, so if it was impermeable it could have formed cave floors for descending streams. One site does hint at this, but it is only a hint: in Sandy Hole, where Apathy (inlet?) Passage drops from a chert seam into World's End. Otherwise, there seems little support for the chert-floor origin, as there is very little space above the chert and the limestone above shows little significant dissolution. Furthermore, the passages follow the chert horizon for long distances.

Again by comparison with the shallow-lying passages of Yorkshire Dales caves, we suggest an initial phreas confined below large areas of the chert, followed by a vadose period for the upper-level caves. (Sandy Hole probably remained sumped). The phreas may have been shallow, so at low pressure and the chert intact over very wide areas, as no large upwardly-dissolved dissolution pockets and avens have been found.

A very thin marl band seems to have guided the roof of the main north-south passages in Sandy Hole, possibly in a similar way to the action of a shale band. Small anastomoses are seen in places in the marl, *e.g.* in Ammonite Passage opposite the Paul's Progress entrance.

A fresh look

Here we apply other people's ideas to our local observations which were initially considered (above) before the following theories were published. Although over-enthusiasm on reading that someone has apparently found a similar type of cave risks carrying analogies too far, considered examining of parallels is no bad thing. Even if such application of others' studies to Portland is later shown to be misguided, at least we will know what did NOT happen in the caves!

Graham (1981) had applied to his local observations, the concept that from initial percolation to final abandonment is a single, continual, entirely post-uplift process. The caves were assumed to have been fed by swallets or percolation water, but the question of how the water first found its way into the bedding-planes did not arise....

Dr Dave Lowe's Inception Horizon Hypothesis (Lowe 1992 and pers. comm.) asks if the initial drainage pre-dates uplift and the present, superimposed, landscapes. The water is forced extremely slowly across huge areas covered by suitable permeable horizons - the Inception Horizons - guided by the nature of particular beds rather than discrete sink to rising effects, but eventually following the regional hydraulic gradient. Much later, structural controls such as joints or beddings, possibly augmented by positions within folds and chemical or other factors will start to influence the flow, favouring certain routes over others.

Following uplift, erosion allows new inlets to the original inception horizons, creating new local drainage networks, though the older regional drainage will still operate. These initial routes are extremely small, but once local captures are established, cave passages can start to form by the usual processes. Sections initially guided by the inception horizons are finally abandoned due to vadose down-cutting.

Discussing the Portland caves, Lowe (pers. comm.) explains this and the importance of relative permeability of the strata in the earliest stages of inception, i.e. before even micro-conduits form. In the Roach, extremely diffuse inception routes would have been created by the original porosity. The inception horizon for the Westcliff caves was not necessarily the chert band (Graham's (1981) 'damp proof course' of Blacknor and Engineers' Holes). Millions of years later, after (here) the Tertiary uplift and development of later landscapes, the ancient inception routes are in place to guide at least part of the modern drainage, but not necessarily following the inception flow's original directions.

If the aquiclude is still intact, phreatic then vadose caves can develop by the usual pattern of captures following the least resistant line down the new hydraulic gradient, all still under the impermeable roof (or on an impermeable floor, elsewhere). An apparent aquiclude may originally have been relatively, potentially, if not effectively, permeable until dissolutional sub-conduits forming in adjacent strata reverse the situation. After inception the early aquifer becomes relatively impermeable, restricting upwards as well as downwards, drainage. The Blacknor Hole chert and the Sandy Hole marl roofs may have behaved in this way.

Thus, Mike Read may be right to place the original Ariel Tunnel roof a few centimetres below the chert, though his debate with Nigel Graham was based on earlier ideas of speleogenesis (simple joint-control, post-uplift). Although the ovoid fragment at Comfort Crawl seems to lack a clear bedding guide, its inception horizon may be an extremely fine bedding-plane/joint junction, or a chemical contrast within the rock.

The chemical factor may be significant on Portland. Ford & Hooper (1964) point to the greater solubility of the aragonitic Roach fossils than the calcite matrix. They record Gray's (1861) comment on the Whit Bed's properties often differing either side of fissures. They also refer to Edmunds & Schaffer (1932)

who examined the porosities both between and within the limestone ooliths (to investigate the stone's weathering properties) To quote:

"It is thought that [the oolith micropore variation] may be partly responsible for the siting of caves at least in the initial stages."

Dr Ian West (pers. comm.) suggests that; no aragonite remained after uplift in Purbeck times subjected it to removal by meteoric water and that 'the .... Roach dissolution warrants further investigation'. Possibly, once definite conduits formed, remaining aragonite was dissolved rapidly in phreatic flows physically or chemically unsuited to encourage replacement calcification.

The limestone was lithified early in its existence, before the shell debris could become highly compacted and the rock deeply buried. Similar Purbeck formation rock was heavily cemented by replacement calcite, but the marine Portland formation Roach retained its high primary porosity. (West, 1983). For cavern inception, the porosity must survive sufficiently to act after uplift, so meteoric water can attack any remaining aragonite - then the calcite of these very pure limestones.

In his letter, Lowe suggested that inception horizons can follow "strong lithological contrasts and/or bedding-planes, but can be far more subtle". Chemical differences are attributable to changes in deposition conditions, *e.g.* as described by Townson (*op. cit.*).

Upwardly-mobile water may be invoked on Portland. Artesian water rose from a deeper aquifer to an inception horizon or an impermeable barrier - such as tabular chert. No lift passages have been found, but Lowe suggests a diffuse artesian aquifer. Physical, or more likely chemical, effects would allow previously-saturated water to concentrate the flow beneath the barrier and develop micro-conduits. West (pers. comm.) points out that the middle Purbeck formation covered most of Portland, confining the aquifer below, until the formation of the Raised Beach in late Pleistocene times cut the Purbeck beds and drained the aquifer southwards.

Our earlier idea of valley-side swallets, Little Neath River Cave style, poses an awkward, obvious question. If a stream sank into its bank below the chert outcrop, why did it not do so when the valley was but centimetres higher, leaving traces of passages above the chert? Any surface-stream water (from land now lost) would have used existing routes forming long before the landscape carrying those streams had developed. It is possible that the Westcliff caves had no swallets and that we now visit the downstream sections of caves whose headwaters were analogous to those of the Grove group.

Summary

The present caves formed in the Anticline, possibly while it was still rising, as Ford & Hooper (*op. cit.*) point out. Applying Lowe's theories, the limestone sequence already contained various inception horizon seepage routes below uniformly impermeable chert or clay, or related to chemical or physical characteristics of the limestone. The seepage routes' formation occupied many millions of years before the Tertiary uplift.

Revising ideas expressed, or referred to, by Graham & Ryder (1983) and Graham (1981), on Lowe's advice (pers. comm.), the Cherty Series caves may initially have carried artesian water rising to existing inception horizon conduits. The trapped phreas suggested by Graham may have formed the present passages, but by Inception Horizon theory, it exploited far older, minute, diffuse routes developed under very different conditions.

The Roach Bed caves as such, may have started developing far earlier, possibly well before the Alpine orogeny (Ford & Hooper 1964). Their Phase (A) of the sequence (*op. cit.*, pp34-35) is recalled by recent finds of small tubes in the joints, which latter may have acted with bedding inception horizons to form three-dimensional inception seepage networks. Again, the observable caves are local structures utilising the older, regional, diffuse drainage routes whose own origins may owe much to the chemical and/or physical peculiarities of the limestone itself.

The vadose passages' history, including dry intervals, is a relatively recent Anticline landscape function, possibly involving sediment-bearing surface stream swallets. The passages were already highly developed under phreatic conditions. Clay Ope Dig is one of several sites with water-lain sediments.

A low-level group of caves (Sandy Hole, Hopeless Hole, etc.) apparently followed a very thin marl band. The passages are phreatic, possibly just becoming vadose late in life (Showerbath Cave) and probably related to the falling water levels which encouraged Blacknor Hole's vadose phase.

The Leicester University work gives ages for the caves and it is quite possible that the various caves were active at much the same time (2-10 million years ago: see above).

Dorset Caving Group and Hardye's School suggested the Inmosthay and Grove caves were originally all linked, but the fragments left by the quarries are so scattered that the idea would be extremely difficult to test. Until recently, noidentifiable vadose features were seen in the Inmosthay and Grove caves. In December 1994, digging exhumed a down-cut, sculpted pot in a silted passage above the south end of Sawmill Cave. Unusually for the area, the sediment showed no sorting or lamination, suggesting steady, continuous deposition.

The rift caves

These exploit the limestone's heavy jointing and are relatively modern, late Pleistocene onwards. The main NNE-SSW fractures (Gullies) are crossed by the secondary East-Westers, plus Rangers (about NW-SE) and Southers (about NNW-SSE), to give them their quarrymen's names. (Fig.3) The rifts provide openings from which to start cutting the dimension stone.

These caves are not tectonic as such, but are formed by mass-movement. Older geology texts describe them as joints enlarged by dissolution. This may be partly true of those on the axis of the island (Devil's Slit, Dolphin Rift, etc.), although the expected features such as irregular profiles and channelled walls are missing. In fact ground water has generally deposited stalagmite.

Rifts parallel to cliffs show classic characteristics, including cambering, though this is surprisingly missing from many, suggesting the outer rock mass is sliding rather than rotating. Most show sizeable fit-features, as Dr R. Halliwell described them (Halliwell 1980), best seen by looking along the passage from some level above the floor. Fit features found on Portland include fossils and their casts in opposite walls, opposing ledges and overhangs at bedding planes and opposing concavities / convexities.

Mass-movement caves can develop below roofs of incompetent strata (here, the Marl and Slatts). This depends on differential movements at bedding planes, where the beds above the plane have slid more or less than those directly below, as in Skittle Alley. (Fig.4). Huge expanses of blank, smooth walls, sometimes collecting flowstone, are common. Cooper (1983) outlines the variety of mechanical effects shown by mass-movement caves.

The rifts are part of the inexorable erosion of Portland, which is literally fraying at the edges, by slab failure. Along Westcliff, exposed Portland Clay weathers to form deep undercuts below the limestone. Eventually the overhanging slice, separated by a main joint, rotates outwards and topples, sometimes leaving masses of flowstone adorning the newly-exposed inland wall of the erstwhile rift, now a fresh cliff face.

The whole procedure is superbly demonstrated to the caver. Steve's Endeavour and C&A Rift are large mass-movement fissures. The former cave is parting off a mass containing another fissure (Gemini Rift), while the outside face has a lot of weathered flowstone clinging to it. Just north of Gemini Rift's main entrance is a pinnacle visible from Fortuneswell, a fragment of old rift wall. The slopes below are a jumble of boulders from older falls (apart from the Weares, which are quarry wastes).

In 1975, Windy Dig and Flagpole Rift widened very slightly, settling or dropping boulders. The movement is very gradual, intermittent and unpredictable, often allowing stalagmite floors to develop. It may be interesting – or worrying - to try measuring any movement.

Less explicable are the Gullies found in quarries in the centre of the island, a long way from the nearest sea cliffs, as in Perryfield Quarry at Easton and at Inmosthay. Even these inland fissures contain no definite dissolutional effects, though some are well decorated.

Rift caves tend to be under-estimated, as their sporting appeal and their numbers are rather limited. They are more common than many cavers think, with fine examples occurring in the Cotswolds (Sally's Rift, etc.) and the North York Moors (the windy pits).

Priory Corner: an active slip.

Priory Corner, the hairpin bend on the A354 above Fortuneswell, crosses an active rift whose track may be visible, depending on any resurfacing. Examine the fissure's outcrop from a vantage point just south of the bend - it is one of the least stable on Portland! In late 1993, Dorset County Council announced its plan to divert the bend onto firm ground, having studied consultants Messrs. A.G Weeks & Partners' report on the area (Weeks 1993).

Weeks used surface observations and bore-hole core and instrument techniques to determine the Priory Corner strata, limit of stable ground and the nature of the landslips. They found the road crosses a slipped, cambered, wedge of Limestone and Portland Sands cut off by a tension crack resting on complex, self-stabilised, older landslips. Southwards, West Weares is fully exposed to erosion, but the main slip is fairly well protected by Chesil Beach and the sea-wall, the lower slopes and the limestone wedge itself. In effect, the slipped limestones and the lower collapse material are in mutual support.

Weeks' opinion is that while catastrophic collapse is very unlikely, continued small settlements over the next several decades could render the road unusable. They recommend a detour inland, on stable ground, via a cutting which would also help stabilise the slip by relieving its load. The report suggests using the old bend as a viewpoint - useful for observing the slip?

Two bore-holes intercepted voids at various depths and from 300 to 750mm high. Obviously their nature is indeterminable from the drilling, but....? Karst cave passages?

Other caves

Fossil submarine freshwater lens caves, as found in Devon, etc. may exist on Portland, hypothetically. A group of small phreatic tubes exposed in an old quarry near The Bill might have formed thus. They are at approximately the same altitude as the Raised Beach. Lowe suggests such caves can form not long (geologically) after the limestones form, while the rock is still at about the contemporary sea-level. These particular caves have not, however, been studied properly, if only because they are sub-caver diameter!

No submarine caves have been reported, although the limestone is submerged deeply at The Bill, though so far no-one has searched for any.

Several Portland caves are hybrids. Ancient stream passages have been cut, transversely or longitudinally, by rifts widening the joints used by the water, again a phenomenon possibly almost unique to Portland. Blacknor Hole, Grove Cliff Caves and Sandy Hole are the major example. The rock movements cut stream sediments as if by a knife, further evidence of the great age difference between the passage types and of the mechanical development of the rifts. Sadly, most of the best cut sediments were soon trampled away by unwitting cavers.

Finding no definite karst chalk caves, by a purely caving definition, in Dorset so far, may not mean they do not exist (Lowe 1992) and (Mullan (and answered by Lowe), 1992). Therefore, what are the origins of the chalk thrust-plane caves at Durdle Door. Was the fault itself an inception horizon and are these genuine sea-caves, or remains of caves cut into by the cliff retreat? (see Elsewhere in Dorset chapter for these and other chalk karst features.)

The Purbeck Hills hold no known caves, apart from the numerous sea-caves. A geological tour (University of Bristol minerals-trade day-school, 1993) of a quarry near Worth Matravers suggested a reason. The soil above the face rested on finely-etched limestone pavement, but below that bands of dense clay protect the massive limestones below. Possible cave entrances are visible in the deeper limestones in Emmett's Hill cliff, but very difficult access has so far delayed exploration.

Speleothems

As elsewhere, there is no pattern to speleothem distribution on Portland, but where they do occur, they can be rather fine. The Grove rifts, for example, contain moonmilk but no crystalline calcite speleothems.

Moonmilk is a calcium carbonate deposit. If the calcite exceeds 90%, it is entitled to be called Mondmilch, according to Fischer (1992), honouring the first record (Gesner 1555) of the deposit at its type cave, Mondmilchloch (Moonmilk Cave!). (Hill & Forti (1993) disagree with Hans Fischer's definition for the formation.)

The Portland moonmilk has not been analysed, so far. Dr Roger Cooper found that in Asberry Windypit 2 (mass-movement rift in Jurassic Corallian limestones and sandstones, N. Yorks.) to be 98% w/w calcite Mondmilch (Cooper 1993). Its fibrous structure is typical of moonmilk, which is formed by bacterial action in the presence of impurities in the limestone (Williams 1960, Bertouille 1972). Sad to say, Flagpole Rift's moonmilk has been devastated by wear (chimneying over it) and by graffiti-scratchers.

Creamy-white flowstone is unusual on Portland. Instead, iron stains the calcite all colours from pale yellow to deep red and brown. Many formations have toothed edges and corresponding rippled surfaces, a common but little-understood phenomenon (Ford 1988). Helictites, mud-roses, etc. are rare, but good straws are fairly common.

Tragically, some of the island's best-known stalactites have been stolen by collectors or souvenir hunters (one group visited the area in the 1960s for just this purpose). This activity should not be confused with the recovery by quarrymen of speleothems otherwise doomed by their work, such as the beautiful "Rosette Gem" crystal pool-flowers, now in Portland Museum.

Cooper (1983) remarks that stalagmitic formations in mass-movement limestone caves are unusual, but moonmilk is common. A few Portland rift caves rival many major stream-caves for speleothem quality, if not quantity.

Conclusions

The origins of Portland's fossil caves are rather enigmatic, but the jigsaw is slowly taking shape. Ancient inception horizons, notably chert or clay beds, were adopted by long phreatic phases, once the Weymouth - Purbeck Anticlines started influencing drainage. The change from regional inception-horizon drainage to the Anticlinal phreas would have been continuous, very gradual and extremely complicated hydrologically. The Anticline landscape and falling sea-level generated vadose development, until the loss of the Anticlinal catchment area dried the caves.

The caves are now dying, shown by block fall resulting from percolation dissolution and mass-movement, passage bisection by mass-movement and truncation by retreating sea-cliffs (mass-movement again!). Speleothems are still forming in both dissolutional and mass-movement caves.

We have tried to answer some questions, but raised others, particularly on the sediments and the properties of the limestones themselves. Assessing rift-caves' activity would be an interesting project, but obviously will have to be handled with the utmost diplomacy! Closer and more critical examinations of the caves and their contents are needed. The jigsaw is far from finished - there is plenty of work, including digging, still to do.

GEOLOGICAL STOP-PRESS:

Since this chapter was written, digging near Sawmill Cave exhumed features which may help explain the role of chert bands in cave development on Portland. See the Twin Pot Cave Description. *NB*: Digging did, but the whole area has now been quarried away, removing all traces of any caves.

Karst features have been found on Purbeck; so far one cave has been noted, in the West face of St. Aldhelm's Head, in Summer 1994. It chokes with sediment about 3m in.

Significant chalk 'pipes' at Ringstead Bay, sectioned by cliff retreat, still contain their infilling mixture of flint fragments and (?) soil. NGR approx. 770 807.

Collapsing chalk cavities caused subsidence of West Stafford by-pass, near Dorchester, in February 1995. Dorset County Council found that the road, built in 1992, lies on 5m of gravel overlaying the Chalk, which has depressions in its surface.

Speleothem samples from mass-movement rifts exposed by quarrying, proved by Uranium-series dating to be considerably older than first thought, This suggests the "island" as such pre-dates the last glacial, but the contemporary cliffs may have been valley walls rather than coast. *Ref. Murphy and Graham, 2010.* Later attempts to date samples from Fossil Cave were inconclusive, but that may reflect the calcite being older than the method used could determine.

Titanites Giganteus: Outsize sleeping attire for the Larger Lady? (*Pete Ryder*, pers. comm…..)

The age of stone

The Portland And Purbeck Stone Trade

The qualities of the Portland and Purbeck limestones have been recognised since Mediaeval times. The two areas have broadly similar geology, but different local conditions led to the trade developing in distinctly different ways.

On Portland, the stone has always been quarried, whereas on Purbeck mining was more economical, although opencast work is used now. Many of the Purbeck mines, short, simple pillar-and-stall galleries cut into the Portland Stone beds, were sited in sea-cliffs, so the stone could be loaded directly into barges. Inland Purbeck mines used sloping adits, up which stone was hauled by horse-powered whim (winch).

A number of the mines are accessible, particularly around Winspit, though a few others are gated bat reserves. TILLY WHIM CAVES, once a show-mine, are well-known, but now closed following fears for their stability.

Uses

The upper beds, being thin and flaggy, are suitable for walling and rockery stone, but little else. The Roach is unsuitable for ashlar or sculpting, but has been used extensively in civil and military engineering and ornamental work.

THE Portland Stone is Whit and Best Beds rock. Both are freestones: soft and easy to cut in any direction when newly extracted, but hardening in the air. (Their weathering characteristics differ.) The original fossils are almost completely comminuted, in a matrix of microscopic ooliths, so the rock is fine-grained and homogenous, rendering it suitable for extremely fine detail work.

These qualities are common to many of the important Jurassic limestones (Bath, Caen, etc.), although the individual stones vary from deposit to deposit.

Top Cap and Cherty stone is now crushed to aggregate, though rough blocks are also used for landscaping, sea-defences and similar work. Certain Cap limestones have been used as high-grade iron-founding flux.

The remaining strata on Portland are commercially useless, although some accessible lower rocks of the Weymouth Anticline have been exploited for local walling, etc. (*e.g.* Forest Marble limestone, around Chickerell and Fleet.) The Weymouth Lowland clays, particularly the Oxford, were used in local brick works until comparatively recently. Fullers' Earth outcrops near Langton Herring and could have been quarried for a fulling mill tenuously believed to have once operated on the site of the present flour mill at Upwey (see Geology chapter).

Large-scale planning consents were granted for building-stone quarrying after the Second World War, to help provide for the extensive rebuilding. A considerable quantity of stone cut then was used for war cemetery crosses (Mason 1984). The consents still apply, to the concern of residents and councillors, as though the permissions were originally for widespread, relatively shallow dimension stone quarries, the modern quarries are much deeper to remove the Cherty Series.

Some current workings are back-filled, although it is recognised that the older holes become vegetated, to the advantage of wildlife. Unfortunately many quarries attract illegal fly-tippers, including local

residents who think nothing of throwing household refuse down them. The present major firm is ARC, some of whose workings concentrate on winning dimension stone and back filling almost straight away.

In 1977 a proposal was published, to expand greatly stone quarrying and to remove the bulk aggregate by sea from a pier to be built at East Weares. The shipping idea arose from examining the both road access and the feasibility of re-building the railway (closed 1965) to the island. The proposal was eventually rejected by the planning authorities.

The other commercial deposits in south Dorset include the oil shales quarried at Kimmeridge in the 1920s (sulphur made it an unpleasant fuel), the oil and gas wells of Purbeck and the Tertiary river sands and gravels near Bere Regis. Many of the buildings in North Dorset are of local sand- and lime- stones and the rocks of west Dorset include soft Liassic limestones once used as local building material. Ironstone, from the hills above Abbotsbury, was found to contain too much silica to be readily usable.

Limestone Extraction

The dimension stones are normally cut by plugs and feathers. Holes are drilled along the cutting lines, a pair of narrow wedges, the feathers, inserted and the tapered plug driven in between the feathers. This produces powerful stresses within the rock, splitting it neatly along the line of holes.

The drilling is now by machine and one major operator has mechanised the process still further. Their process involves using plugs and feathers in many closely-spaced horizontal holes across only the base of the block to be removed. The back and sides of the block are cut by a massive chain-saw, moving along rails laid along the quarry bench. The resulting square-cut blocks have perhaps a natural bedding top face, a feathered bottom surface and four sawn sides. Furthermore, the saw's replaceable tungsten-carbide teeth cut a very narrow kerf, while the close spacing of the feathering holes minimises the loss on the split surfaces. Consequently the stone wasted in subsequent machining is an absolute minimum.

Unfortunately a far-less sympathetic technique marked the recent operations of another company on the Island. Their contractors' idea of cutting dimension stone was to try blasting it out, to the dismay of nearby residents. This approach certainly made big holes bigger, but wasted many tons of fine limestone.

The aggregate stones are normally blasted out, then crushed and graded in the quarries, using portable plant. The laden lorries pass over weigh bridges and at Coombefield Quarries at least, a wheel-washing plant, before going out onto the public roads.

History of the Trade

Although Portland Stone was used locally in Mediaeval times, the earliest recorded exports were to Exeter Cathedral, Westminster and the Tower of London, all in the 1300s, followed by Tudor (16th. Century) accounts. Export in this context means sale from Portland, but not necessarily overseas.

Most of that stone was removed from landslips and the cliffs, but by the 17th. Century quarrying was inland, to the dismay of the locals. Exported freestone was therefore taxed at 12d (5p) per ton, to the benefit of both Royal Manor of Portland and the community. Cromwell's republic interrupted this, so the Commoners petitioned Charles II for its re-instatement. The compensation was for

Commons much wasted by the break of ground and spoiled as to herbage to the great damage of the inhabitants

Noting the islanders' loyalty to our late Royal Father, the King granted the compensation order, its administration overseen by a legally-appointed surveyor, by charter signed at Court in Oxford, November 3rd. 1665. The new tax was still a shilling per ton, on stone for Crown contracts. Three pence

went to the Crown, the remaining 9d from each shilling being for the sole use and benefit of the inhabitants. The original document is kept by Bath & Portland Stone, but a facsimile is shown at Portland Museum.

Crown contracts were particularly important in the late 17th/early 18th Centuries. On October 11th 1700, Sir Christopher Wren signed a contract for 2000 tons of stone for HM Dockyard, Portsmouth. Wren's most famous work is St. Paul's Cathedral and such was his power he stopped any export of stone from Portland for any other work, between 1675 and 1717. Weymouth tried exploiting Wren's trade by electing him MP in 1702, but he evidently preferred Whit Bed to Westminster, serving for only a year!

Pennsylvania Castle Hotel, above Church Ope Cove, was originally the home of the Penn family, after whom the American state is named. William Penn, the state's first Governor, imported Portland Stone blocks to define the boundary with Maryland (that part of Pennsylvania later became Delaware). The boundary was set by two English surveyors, Mason and Dixon, their work immortalising their names as the North-South boundary in the Civil War: the Mason-Dixon Line.

As the trade grew, the quarries moved inland from cliffs, over which was dumped the overburden (including Roach) to form the Weares. The Merchant's Tramway was opened in 1826, serving the quarries in the north of the island via a series of tramways whose remains are visible as rows of square stone blocks, to which the rails were spiked, set in the ground. The Tramway descended a deep cutting near the Verne, flanked the Verne slopes above Fortuneswell then descended to Castletown by a steep ramp clearly visible from Wyke Regis. Stone was loaded onto ships at a pier now used as a fishermen's wharf. The track bed is a now a justly popular footpath.

The railway from Weymouth reached Portland in 1865, being extended later to Easton, and stone was a significant part of its trade. (The Great Western Railway proposal to build a new harbour at Bincleaves, in the NE corner of Portland Harbour, was still-born, but the Railway Dock Hotel stood hopefully near Bincleaves until demolition in the late 1980s.)

Massive defence works built in the late 19th. Century used great quantities of Portland Stone, including the Roach, hitherto regarded as useless. Portland Prison was built at the Grove, to house convicts, under a brutal regime, engaged in quarrying and service works for the Crown, including Verne Citadel, Nothe Fort and Portland Breakwater. The prison is now the Young Offenders' Institution (formerly Borstal Institution). The Verne Citadel is now HM Prison. It is not underground, as many think. The entrance tunnels simply pass through huge embanked ramparts.

The Breakwater was a huge project by any standards, standing as it does in up to 60 feet of water. It was built by contractors for the Admiralty, with few if any convicts among the builders, although convicts worked in the quarries. Its stone was carried from quarries between the Verne and Grove on the Admiralty Incline Railway, partly for engineering reasons, partly to avoid the Merchants Railway operators' terrible practice of using the horses as living skids to brake descending wagons. The Incline is now a road to the Naval Base (now due to close in 1996). The Breakwater still swallows stone, to repair winter storm damage.

In the late 1930s new uses for the stone included Caps and Roach being sold for blast-furnace fluxing, cement-making, aggregate, agricultural lime, etc. Waste freestone became used in reconstituted stone, which is concrete using crushed stone as aggregate. Purists were upset, but at least it was all trade for an area suffering reduced demand for masonry stone.

Some 100 000 tons per year of crushed-rock product trade was lost in the 1960s, following increasing competition for such material and a great decline in dimension-stone sales. The railway closed in 1965, either in response to, or adding to, the stone trade depression.

One material not connected with Portland is.... Portland Cement, it being impracticable to bring the clay and fuel to the area rather than take the stone closer to them. The name describes the appearance of Portland cement mortar. Lime, but not cement, was burnt and used on Portland in the past.

Recently, the demand for dimension stone has increased, but crushed rock still dominates. The quarries now extract both.

The Portland masonry trade is a fraction of its former self, but is still significant. In 1988, it supplied the National Gallery Extensions with fine masonry - and sold the off-cuts via advertisements in local newspapers. Locally-trained skilled masons are well regarded, many finding work on cathedral repairs, etc.

The quarrymen use the gullies (rifts) as access to the ends of the strata, but the water worn caves must be a nuisance during blasting operations. The passages probably cause little waste, as they are mainly in the Roach or the Cherty Series, rather than in the dimension-stone beds.

The older quarrymen had poetic names for stalagmite; fossil water was perhaps the most accurate. Portland Museum contains formations rescued from quarries. Perhaps the most beautiful is the Rosette Gem, found in 1929 by a Mr R. Peters, who recovered it from a bedding plane exposed by blasting in Broadcroft Quarry. The formation was displayed publicly in 1930, but otherwise lay in the family home until bequeathed to the Museum by Mr Peters' daughter, Mrs Vera Snowdon, in 1983.

The Rosette Gem was described by British Natural History Museum mineralogists as unique. A layer of ordinary calcite, about 6 inches long by 3 wide, bears a layer of amber-coloured calcite crystal about 3/8 in. thick, resembling treacle tart. The rosettes have grown on this: pool formations of radial crystal flowers up to 1 in. diameter and $^3/_4$ in. high, with stumpy stems and flat disc tops. Some have little central cones on top. The speleothem is most unusual, though probably not a unique type.

Purbeck Stone

The Isle (a complete misnomer!) of Purbeck comprises similar rocks to Portland, although its structure and stratigraphy have several important differences. Its stone trade was rarely as intensive as that of Portland, nevertheless it has continued from Roman times to the present.

Purbeck's most famous stone is its Marble, the name meaning it is easily polished (not metamorphic). It is a freshwater limestone graveyard of little pond snails, which give it a curious mottled appearance. The Marble is thinly bedded and rather weak, so is used chiefly for dry-stone walling and decorative detailing.

The Romans used it extensively throughout the first four centuries A.D., often a great many leagues away from Dorset. The stone's next popularity came in the 12-14th centuries, for decorative work in major cathedrals. A typical use was the ring of thin ornamental Marble columns cladding the tougher limestone structural column within. The thin bedding means Purbeck Marble columns are of stone stood on end. Purbeck Marble became sought-after for effigies until alabaster became the designer stone in the 15th. Century. Early effigies were usually rather flat, just as well for the fuller figure would not have been complimented by the thin rock.

The Marble trade centre was Corfe Castle, where stone from numerous small quarries along the ridge was squared, or even finish-cut, stored and sent out along a track to Poole Harbour. The other limestones were not neglected. Indeed the Purbeck Portland Stones (!) had the trade edge over Portland until the late 17th. Century, for practical reasons. Deep overburden, tough waste Roach, the steep hill down from the quarries and landslips at Castleton (whence the stone was shipped) were real problems on Portland at the time.

From the early 1700s to the late 1800s, Purbeck and Portland were equally important. Mines developed along the coast, and inland along the north-dipping, north limb of the Purbeck Anticline, from Swanage, the new trade centre. As these quarries worked out, the trade spread west to Langton Matravers area, although the transport distance became more significant.

Despite the volume of trade, it was appallingly inefficient, with stone blocks being handled perhaps five times from mine, onto carts, on and off the bankers (store stacks), then onto special carts drawn out to meet barges which finally carried them to ships waiting out in deeper water.

The stone trade's decline in the late 19th. Century was foreseen by John Mowlem, founder of the civil engineering firm, and nephew George Burt. Their ships taking stone to London returned ballasted with all manner of London street fittings, surplus masonry and so on, with which to beautify Swanage as it became a genteel seaside resort. Durlston Castle Hotel and its Great Globe (of Portland Stone, carved at Greenwich) are triumphant symbols of these two local businessmen. Purbeck Stone is still quarried for dry stone wall material, decorative work, etc.

The oil-shales of Kimmeridge were used in Bronze Age and Roman times for decorative items, ranging from turned jewellery to furniture parts. Deposits of shale discs were once thought by archaeologists to be coins, but are now recognised as the lathe waste. The shale was long used locally as a domestic fuel, and was mined commercially in the late 19th. Century for its oil and alum, but proved too sulphurous to be viable for long. A few traces of the mines and connecting tramways remain. A small well at Kimmeridge has been producing oil since the 1950s, its nodding-donkey pump is a familiar local landmark. Recently BP developed its oil and gas gathering station at Wych Farm, near Corfe Castle. North and west of Purbeck are important sand and gravel quarries and Ball Clay lens mines.

As cavers we have decidedly mixed feelings about quarrying. In Dorset, we have always had a live-and-let-live attitude as far as possible, perhaps partly because the caves found in Portland's quarries are not so significant.

Comments in favour of the caves have been made as appropriate in public planning debates, and we have always tried to preserve the more important caves. Luckily, the major caves are safe, some protected ironically by houses or roads.

Let's face it, we would not have known of some caves' existence were it not for quarrying. Even so, much has been lost. Perhaps we may be consoled by reflecting that Portland has for some centuries supplied a beautiful dimension limestone for some of the finest architecture and sculpture created. How much cave passage was lost to such creations?

Elsewhere in Dorset

Limestones and Chalk are major rocks in Dorset, but Portland is virtually the only area with caves, although a few karst features occur elsewhere.

CULPEPPER'S DISH (near Affpuddle) SY 8140 9251

Against north side of road crossing Affpuddle Heath south-east of Bere Regis. Signposted car-park opposite.

Huge, wooded doline, the largest of many developed along the fringes of Tertiary sands and gravels overlying the Chalk. The underlying chalk pipe or cavern has swallowed about 50,000 cubic metres of sediment (House, 1993).

These dolines have attracted a lot of attention, e.g. Fisher (1859), Sperling (1977).

DURDLE DOOR SY 804 803

Signposted roads from Winfrith Newburgh - West Lulworth (Lulworth Cove) road. Only one car-park (fee charged). The coast here is spectacular, and well served by footpaths.

Durdle Door itself is not a cave, but a lofty arch eroded through a remnant of the Portland and Purbeck beds fronting a promontory. The rocks are impressively folded, and dip almost vertically north.

West along the beach from the Door are a notable set of small sea-caves, the longest only about 12 ft (4m) long, formed in a thrust-plane in the chalk (Perkins 1977). Note the flat floor, dipping outwards (south), and the brecciated walls. The W end of the beach is marked by Bats Head, in the chalk, with a sea cave running through it.

The beach is popular with bathers, and unfortunately the caves are littered and used as toilets.

HARDY'S MONUMENT POT SY 6130 8745 Lost itself.

NW across road from Hardy's Monument, above Portesham. (The Monument is to Dorset man Capt. Hardy, Admiral Nelson's flag-captain and commander of HMS Victory at Trafalgar.) Explored 1975(?) by DCG, who found the wire-mesh fence and Danger-Deep Hole sign irresistible. Then, the pot was 25 ft deep, about 10 ft diameter at the base, with an ominously overhanging rim in clayey gravel, hidden by long grass. By 1990 the pot was little more than a steep-sided hollow. It was a similar feature to Culpepper's Dish, albeit far smaller. House (1993) points out that Bronkham Hill, south-east of the Monument, has some 200 dolines, and a number of bronze age burial mounds. (Also Sperling, et al (1977)).

KIMMERIDGE OIL-SHALE ADITS (around) SY 920 777 Almost lost.

The cliffs around Clavell's Hard, about $^{3}/_{4}$ mile east of Kimmeridge Bay, once contained oil-shale mines still referred to in geology and history texts. A few traces remain, both of the adits and of the tramway which served them, but have practically disappeared due to erosion. If any open tunnel does exist, it will almost certainly be in suicidally dangerous condition and accessible only by abseiling down a crumbling shale cliff. We have not attempted it, and do not advise it!

LULWORTH COVE & STAIR HOLE SY 826 797

The Cove, a busy tourist attraction, is cut into the Wealden Clay and Chalk behind a breached wall of Portland/Purbeck limestones dipping almost vertically north. Shallow caves, little more than rock shelters, exist in the limestone.

Stair Hole (SY 822 798), just west of Lulworth Cove, is an embryonic cove. The sea has cut a gap and arches through the limestone and is now removing the clays between the limestone and chalk. The arches are joined by a passage containing deep water (sumps at high tides; free-diving inadvisable) and an aven above the west arch opens in the cliff above. The eastern arch contains two sea-caves in its east wall, one about 50 ft long to a sandy beach, the other shorter with deep water. Another short cave lies in the west wall of Stair Hole. These caves offer some aquatic fun in reasonably calm conditions, but note that the water in the arches is deep and strong tidal streams sweep past the seaward side of the wall. The caves are formed across the near-vertical bedding of the spectacular fold known as the Lulworth Crumple. (Explored 1993, WCC)

East of Lulworth Cove is the Fossil Forest, a terrace exposing several large tufaceous tree burrs in the Purbeck limestone. Access is via a footpath from the Cove. Warning: observe the army range danger notices and instructions.

ORIENTEERS' SWALLET (near Affpuddle) SY 8130 9240 approx.

In forest south west of Culpepper's Dish. Downhill to south of signed Culpepper's Dish car-park is a major forestry track, accessible via footpath shortly west of car-park. Follow track west to its bend around shallow, marshy valley head in deciduous woods. Follow valley down to swallet and succeeding depressions.

The sink, in chalk, was a choked pot about 5ft deep below the valley wall. By late 1994, silting and vegetation reduced it to a GrimpenMire-ish mudpool.

Found by DCG members taking part in a Poole Orienteering Club open event in 1974 or 5: the route skirted the valley.

PARSON'S BARN (Swanage) SZ 053 822

Large sea-cave in chalk cliff near Handfast Point, NE of Swanage. Reputedly named by comparison with an actual local farm building. The O.S. maps mark this and un-named caves at Ballard Point, to the south. Not explored for this book.

PONDFIELD COVE CAVE (Worbarrow) SY 8713 7955 Unsurveyed

Pondfield Cove is the small cove between the east side of Worbarrow Tout and the west end of Gad Cliff. A large sea cave in the Portland series is reached by boat or a short swim. Gad Cliff itself is a huge expanse of unexplored limestone above very steep clays. It is virtually inaccessible, both physically and because it lies in the tank gunnery range overshoot area.

PURBECK HILLS (East Dorset)

This is Dorset's largest limestone area, forming a fine ridge along the coast south of the vale of the County's main rivers and Poole Harbour. Although the Portland and Purbeck limestones have been mined and quarried for centuries, leaving numerous short mines still accessible (and a few gated as bat reserves), no karst caves are known, though prospecting continues.

The coast between St. Aldhelm's Head and Swanage contains many large sea-caves and joint-controlled zawns. Refer to the climbing guidebooks (and be an experienced climber!). Seasonal access restrictions to the cliff faces apply, detailed in the climbing books. Warning: the mine workings are extremely unstable.

REDEND POINT CAVES (Studland Bay, East Dorset) SZ 038 828

Three unusual small caves (lengths 2.5, 4.5, 6 metres) exist on small headlands of Tertiary sandstones and ironstones at Studland Bay. The largest, widening to 3m wide by 2.5m high inside before tapering to the end, is on the extreme end of Redend Point. The others are in a small headland to the North, 100m south of the path to Studland Middle Beach.

They are developed along joints in the ferruginous sandstone (ironstone concretions protrude from the roofs).

First recorded, John Noble (Bristol Exploration Club). For his detailed morphological and geological descriptions, with sketch surveys, ref. Noble (1981).

SUBMARINE CAVES (West Dorset)

Cave entrances have been reported, by open-water divers, a short distance off-shore near Burton Bradstock. Not yet confirmed, or explored by cave-divers.

TILLY WHIM CAVES (Purbeck) SZ 031 769

Short mines in the Portland Stones of the cliffs at Durlston, near Swanage. They were open for many years as show-mines, but closed by Dorset County Council in 1976 as the roofs and cliff faces are dangerously unstable. The main gate is locked and access discouraged. Three roomy galleries, total length approx. 300 ft (90 m).

UPWEY WISHING WELL (Upwey) SY 6605 8525

Upwey (!), fully signposted from the A354 about four miles from Weymouth towards Dorchester.

The Wishing Well, the source of the River Wey and for long a tourist attraction, is a large spring rising from, or at the base of, the Portland beds, here dipping 15° north. If any enterable passage exists behind the rising, it will be for cave-divers only, but permission to find out was declined. See Geology chapter. In July 1991, erosion caused the Well to subside and it was closed for two weeks for rebuilding.

Though not speleologically significant, we may mention the 18th. Century spa at Nottington (SY 6635 8270). Its waters are strongly sulphurous and taste very unpleasant. It is said to have been discovered by a shepherd noticing the curative effects of the spring waters on skin disorders suffered by his sheep.

The octagonal spa building is now a private house, but the spa water is still available to the owners. The water must be rising from the Kimmeridge shales for it to be so mineralised. By contrast, the Wishing Well water is very palatable indeed!

WALDITCH CAVE (near Bridport) SY 485 922 L.150 ft (46 m)

Located in a Jurassic-limestone-topped plateau just south of the village of Walditch, near Bridport (west. Dorset).

A single, straight, phreatic, joint-controlled passage runs from an initially-narrow entrance, widening, to end in a total collapse. Halfway along, a boulder choke is passed only by a very difficult vertical corkscrew manoeuvre (though not difficult enough to deter adventurous local children!).

Following a search of the cave by a rather bizarre (non-caving) rescue organization assisting with a far wider search for missing local woman Jo Ramsden[1], in Spring 1991, there were calls for the cave to be closed. It seems nature intervened, by loosening the first choke and by sending bats in!

Always open. Surveyed by C. Proctor and N. Poole (Bridport Caving Group), 1987.

Ref. Glanvill, Dr P. and Poole, N. Walditch Cave, *Descent* No. 82 (July 1988) pp30-31.

Miscellaneous

A few sea-caves exist in the east-central Dorset chalk cliffs, most accessible only by boat and some might be partially karstic, although we have investigated only those at Durdle Door, above. Deep solution pipes, originally filled by valley-gravel sediments, occur in the chalk. Some are exposed by retreating sea-cliffs, as at Red Hole, St. Oswald's Bay (SY 812 803, access as for Durdle Door), where the considerable depths of these old shafts can be observed. The Red is rust on the cliff face, from ironstone within the valley-gravels (Perkins 1977). Particularly good bisected pipes exist in the chalk cliff at White Nothe (Ringstead, approx SY770807), containing a fill of loam(?) and flint gravel. The fragmented limestone along this coast contains nought but a few, generally inaccessible, sea-caves.

Oil-shale was mined for a time at Kimmeridge and disused adits existed at least until fairly recently at Clavell's Hard, along the coast east of Kimmeridge Bay (east. Dorset). Traces of one remain (seen summer 1993), high in crumbling shale cliffs. We have not attempted to enter it - we are not suicidal!

There have been unconfirmed reports of large freshwater springs off the Purbeck coast and perhaps a cave in submarine limestone off west Dorset, yet to be investigated (July 1993).

No complete karst chalk caves are known in Dorset, but that may not mean there are none: see Reeve (1981).

[1]Jo Ramsden went missing in April 1991. Her body was found in a west Dorset wood in March 1992. She had been abducted and probably murdered, but charges against the prime suspect were dropped due to lack of evidence.

Of caves and cavers

Portland's caving history

This chapter has been compiled largely from the Dorset Caving Group Journal and by reference to CRG, BCRA, etc., reports.

Geology & archaeology

Gray (1861) was probably the first to describe the fissures in the limestones, in any detail, although various papers since Fitton's (1836) brief record reported primarily on bones found within them, starting with Neale (1852). Gray also described a richly-decorated grotto in Freeman's Quarry, near St. George's Church, and a natural watercourse 3 feet by 2 feet in Verne Ditch, under construction. The watercourse was filled by layers of sediment. He recorded the island's natural drainage, and the Whit Bed's habit of differing in properties either side of the fissures. This variation is important to the stone trade: Edmunds and Schaffer (1932) investigated the stone's porosities and weathering properties.

Prestwich (1875) investigated a "Mammaliferous Drift" up to 20 feet deep and 60 yards wide, running SW for nearly 300 yards, near the Verne. The mammal bones lay in gravel at the base (Arkell 1947, p.336 and Carreck 1955 pp164-188). The deposit was subsequently destroyed, but small sediment deposits are seen in Admiralty Rift.

These papers were accurate records, but Allen (1863) was responsible for a bizarre argument in "The Geologist". He held, despite others replying that Portland limestones originated on the sea-bed, that finding human and animal bones within the fissures showed them to be Jurassic!

Subsequently, a wide variety of Late Pleistocene to modern, including domesticated, mammal remains have been identified, along with assorted artefacts from Bronze Age to Civil War times, although by no means all were found in rifts.

Although the fissures were extensively recorded then, as archaeological sites, little attention was paid to their geology. Even less attention was paid to the solutional caves. Gray's 1861 paper was almost an exception.

University of Leicester geology students on a field trip in 1962 were aware of pieces of stalagmite emanating from very narrow fissures in quarries, but had not been told of any caves. They were therefore surprised to find a "substantial" decorated cave in one of the quarries (Ford & Hooper 1964).

To 1970

Geological studies, then, had ignored the water worn caves, as did the quarrymen, but described the rifts (if at all) as solutional. Then a few locals, including M. Dewdney-York, N. Bowley and R. Milverton, and Weymouth Venture Scouts, started digging WHITE RIVER CAVE and surveying the caves then known.

In 1964, Dr Trevor Ford and Leicester University Speleological Society with local assistance, published the first comprehensive study of the caves, in Cave Research Group Transactions, based on visits starting in 1962. They had surveyed SAWMILL and THRUTCH (Fossil) CAVES in 1963,

By 1969 there were a few isolated groups of local cavers. George Dobson, John Marshall and Paul Jefferson (Herrison Hospital staff), resumed WCC's abandoned SANDY HOLE dig, entered Prize Day Passage on the evening of the hospital staff awards day, then removed a second choke into the Inkwell. Two local Border Caving Group members became interested in Portland, as did others including Mike O'Connor (WCC). These cavers became acquainted with each other in late 1969, partly on trips to Mendip.

New club

These people inaugurated the DORSET CAVING GROUP on November 16th, 1971. Sandy Hole and the CROCODILE CANYON survey were the Group's first successes. An exhibition at Dorset County Library in January 1972 established contacts with Hardye's School (Dorchester) and Weymouth Venture Scout Unit. Hardye's School Combined Cadet Force cavers' leader, Captain Andrew MacTavish, was also an English teacher, hence the rather literary cave names. The first stage of the Sandy Hole survey was nearly complete, and thereby hangs a tale. Nobody knows the whereabouts of that original survey, apart from a fragment owned by M. O'Connor and reproduced here. 'Purbeck Speleo' was apparently a psudonym used by some of the Portland cavers then.

HSCCF and DCG continued the WVSU and LUSS work, systematically surveying most of the island's larger caves and recording then in the Dorset Caving Group Journal.

There was no rivalry: the school and club shared results and jointly explored Sandy Hole (1971-2) and Blacknor Hole (1974 on). Each group explored its own bits of the caves. The school moled in North Passage, whilst the DCG dug into a choked side passage at the south end of Ammonite Passage and linked Sharbutts Rift to the passage below.

In late 1974, the DCG was at its height, happily planning a Vercors trip to follow its first, very enjoyable, foreign caving holiday in the French Jura. These areas were not yet widely known to British cavers, and the DCG relied on the experiences there of Cambridge University Caving Club. The Journal was steadily publishing Portland surveys and The Sandy Saga (continued) - material for this book - with descriptions traditionally concluded with locations of the nearest pubs. So it was an enthusiastic group which received news of a strange black square on photographs of Westcliff, commissioned by HSCCF from the Royal Navy, to illustrate climbing routes.

DCG ran an abseiling practise on Westcliff: SRT was then a new brew! Ian Wolff, the DCG Tackle Secretary and an ex-Hardyean, found the black square was a cave entrance indeed. HSCCF were told "You've found a cave" and thus started the joint exploration of BLACKNOR HOLE (MacTavish 1975).

Rescue

By Summer 1975, the system was known to Nutcracker Rift on the DCG's side, and to the school's dig at the end of Ariel Passage. HSCCF ceased work on the verge, had they but realised it, of entering the Confluence, but produced a preliminary survey. DCG found Fool's Paradise. Paul Grassby (HSCCF) pushed Grasshopper Squeeze and linked Query Rift to Grand Canyon via Three-Stone Squeeze. (C & A Rift: students Churchill and Avery.)

In July 1975, seven DCG members entered Blacknor Hole to push Nutcracker Rift. As he scrambled up to Grasshopper Squeeze, Royal Navy helicopter mechanic Dave Hunter dislodged a large block, breaking his leg. Smaller debris fell into the crawl, so the three already beyond, including the authors, had to dig their way out to reach Dave as he lay calling for help. The rescue took several hours, involving any number of local cavers, Coast guards and finally a Royal Navy helicopter. MRO stood by -and were inadvertently stood down early by a message mis-transmitted via the non-cavers involved. Fortunately they were not, in the end, needed. The rescue went smoothly, considering few of those involved had any cave rescue experience. Despite considerable pain, Dave remained calm, even quipping as he lay waiting for help, If they send a helicopter, I hope it's not the one I service!

Local freelance photographer Reg Vincent's triptych showing the casualty being lowered from Queen's Entrance (in a Neil Robertson stretcher, with Ian Wolff guiding), down the cliff, to the helicopter hovering over the beach, occupied the local paper's front page. One of the pictures is on the cover of Descent No.32. The Dorset Evening Echo coverage wryly amused the DCG, especially Dave and Ian themselves, who thought themselves real ladies' men, as the rescue report had shunted that on the crowning of Weymouth Carnival Queen on to the back page. Later a Coast guard officer exhibited a large model of the cliff-face scene, at Earl's Court etc.

This was Portland's first - and we hope last - major cave rescue. Of all who took part, one stands out. On his first caving trip, with the unpleasant ladder pitch on the exposed cliff, local G.P. Dr Barnard-Jones tended Dave underground.

Following the accident, interest in the cave declined for some years.

Decline

By the early 1980s the DCG was declining. Its last Journal, in 1980, reported the club discovering the Confluence in Blacknor Hole, three weeks before WPVSU entered from Ariel Tunnel. By then, the diggers were a local WCC/DCG/Speleo Rhal trio, but visitors had been inveigled into helping. Hence Westminster Speleological Group literally kicked the Nutcracker Rift choke into submission, allowing Bath University Caving Club to find Via Aquae Sulis. By 1985, HSCCF apparently stopped caving and the DCG was just a name and bank account. The remaining cash was donated to MRO, whose receipt and letter of thanks and condolences for the club is dated 1st April 1985.

The DCG had about thirty members at most, yet was very active for ten years, with excursions to the Jura and Vercors before these were on the regular British cavers' holiday list. (It found the Grotte de Gournier stream way in one trip: the obscure boulder chokes had defied many visitors!). It called itself a Group, not a Club, but had an officer list as long as your arm and invented a wonderfully complex constitution and meetings system. However, it had neither Committee nor Chairman: open meetings (in the pub) dealt with formalities.

More usefully, DCG members were using nickel-cadmium batteries and Cyalumes in the early '70s and experimented with the new SRT. After several SRT accidents, some fatal, in other clubs in the 1970s, the DCG used its Club SRT ropes only for abseiling at Blacknor Hole, in Swinsto Hole, etc.

One founding Herrison/DCG member was Mike Hodder, whose resistivity cave prediction and surveying research has, unfortunately, never been published. Experiments over known Swildon's Hole reputedly produced interesting anomalies to the left of the Wet Way, well before Renascence Series and Lowbow were found.

Legacy

The important legacy of Weymouth Venture Scouts, DCG and HSCCF was their systematic Portland cave exploration, surveying and publishing, following on from the Leicester University work.

Warp factor

So, what next? Enter Moldywarps Speleological Group. The MSG must be among the least formal of the country's caving clubs, but its attributable total of cave found, surveyed and published is incredible, often in places many cavers have never heard of, let alone searched. Pete Ryder and company re-surveyed Sandy Hole and Dr Roger Cooper investigated the large Westcliff rifts, putting them firmly in their context.

Inspiration and non-alignment

In the late 1980s, independent locals, Phil Strong, Anthony Ward and Martin Crocker found the present writer via caving literature. They were inspired by an ex-caving teacher, whose extraordinary predicted local master system was based on total innocence of basic speleology. They are the independents referred to in this book.

The independent/+ one WCC-member team thought GUANO RIFT etc. too short, so soon linked these rifts, opened ALLOTMENT DIG and started digging downwards. Work continues (1993). Other YAC (subsequently WCC members) Wayne Brown, Dominic Sealy and Eddy Waters took on various projects, including Engineers' Dig and most recently, the unexplored sea-caves at the Bill. This also gave the YAC (now WOAC) greater informal contact with the general caving world.

Return of the venture scouts

In the 1980s, the WPVSU's caving, under Mike Read's influence, increased. Thinking they were alone, they resumed Hardye's Ariel Tunnel dig in 1980. Returning there three weeks after Nigel Graham, Gaynam Lock and Tony Bown found The Confluence from Via Aquae Sulis, they were astonished to see another way into it, left by unknowns who had left nothing but an intact tin of rice pudding, which was delicious. It took some doing for the two groups to locate each other.

Sadly, the old co-operation and the entertaining trips with visiting clubs gave way to mutual feelings that each was losing his cave to the other lot. Peace was restored eventually and those involved settled down to explore different areas. Thefts of digging tools, and of stal from Hopeless Hole, were more serious, affecting both teams. The loss of equipment from Allotment Dig was blamed on local children, but its re-appearance was rather mysterious.

In 1986, WPVSU finally bypassed the suicidal dig in Fairy Rift's massive choke on the main water worn passage, by clearing Wriggle Push. Co-operation returned, in radio-locating the extremities of Sandy Hole (north) and Blacknor Hole (south). The WPVSU diggers continued probing the complex chokes from both caves, with breaks to dig in Hopeless Hole. In January 1994, just as this book was going to press, Mike Read announced that Sandy and Blacknor Holes form one system, although the precise relationship of the various passages is still unclear.

The WCC/ Independents' Allotment Dig ran into problems at the end of 1993. With an estimated 20 feet depth still to clear, the team decided the rift had almost certainly been briefly un-roofed and artificially filled when the prison and road were built in the 19thC. Coffin Hole was dug for a few feet to apparently break out of the cliff in the "wrong" place, under the debris slope, rendering the sought continuation even less likely.

And now....?

To the end of 1993, most of the caves have had fairly few visitors, locals apart, although a few suffered from over-use. As elsewhere, Portland's predicted caves are elusive, needing committed digging. Geological and speleological puzzles remain. Do submarine limestone caves exist off Portland or Purbeck? Original caving on Portland started about 1960 and clubs and people have come and gone. Now, it is as active as ever....

Poetic licence

The Dorset Caving Group occasionally enlivened its Journal with poems, chiefly by Mike O'Connor and Andy MacTavish. Although these opii were based on Portland caving, some rise above being mere club in-jokes, even being nearly universal. The style of some will be obvious to any seasoned Mendip caver: we trust Alfie Collins will take the Portland odes as a compliment to his Spelaeodes! Brief introductions will not, we hope, spoil them. As far as the Sandy Hole poems go, just refer back to the cave's description!

The references are to the DCG Journal.

The Technical Tale of Albert Rand

This epic alludes to Mike Hodder, of Herrison Hospital staff and a DCG founder member, who was noted for his subterranean ingenuity.... and to an unsuccessful planning application for a fertiliser factory to be sited at the Grove.

Mike O'Connor, helped by Elizabeth Gill, Andrew MacTavish and Nigel Hewitt. Vol.1 No.5. Oct 1975

This is the tale of Albert Rand
Who did his caving on Portland
And with a group of caver blokes
Was wont to dig at manky chokes
And push through passages small and tight
Like some persistent speleo blight.
He'd search with great enthusiasm
For some huge and awful chasm
And thought by means of technical jig
To find the spot to bang and dig.
Now one momentous star-struck night,
Two grimy cavers came in sight
Telling tales to our lad Bert
Found lying in entrance dirt,
Of lengths of crawl in Sandy Hole
Fit only for demented mole
Which opened outwards at long last
Into a passage grim and vast
T'was almost nine feet wide by four,
And would have made a good dance floor,
But shortly went back short and thin
Because a rift had caused cave-in.
However there remained a hole
With proportions quite small and droll
Into which you could insert a fist
If first the ground with face you kissed,
At which the caver said that this
Was like some other orifice.
Bert, now prompted into motion,
Went down Sandy with a notion
To see this choked and broke-down place
And took with him a huge great case,
Intending there to push and prod
With his long-range resistance rod,
Or find something to use on slot
Which might resolve a decent pot.
He worked and worked creating din
Like carbide lights in ammo tin
But only made himself much older
Because of daft small bleedin' boulder,
And giving up with muddied tear
Consoled himself with pints of beer.
This set-back did not daunt our lad,
Who went from methods worse to bad
In order that he'd find a way
To shift that boulder small and grey.
He sat and thought (whilst lads all laughed),
And even turned down jars of draught,
Till blokes within the Caving Group
That he'd got that well-known droop.
Then suddenly he yelled, That's it!
Causing mates to choke and spit.
For days he worked within his shed,
Hardly sparing time for bed.
At last device took on its shape
And chappies came to stare and gape
At a one foot length of iron pipe
Of the very best superior type,
With at one end a welded plate
Which gainst the rock twas meant to grate
Whilst the other end had a hole
Which wasn't meant for usual pole,
But took a specially-sized bolt
To give the rock a good-sized jolt.
By gunpowder twas to be fired
After the passages had been wired.
Then came the day to try it out
And brave men said there was a drought
And rushed off to a pub nearby
To drown themselves till news was nigh.

Down went a bunch of lads intrepid
Keeness from luke-warm to tepid,
And finally came our lad Bert
With gunpowder shoved up his shirt.
Along the passage they took device
And had it set up in a trice....
....Now unbeknown to the caving crew
A chemical firm large and new
By use of many a big lorry
Was dumping waste stuff in a quarry.
This soon seeped down through creviced rock
And bottled up behind a block,
Reacting with the bed of clay
Which just beneath the limestone lay,
Producing high explosive stuff
That only needed short sharp puff.
The lads moved back whilst laying wire,
Tension and voices rising higher,
Till at last in dreaded Inkwell sat
With moments pause to cram a hat.
Bert took wire which he straightway lit
Thus jumping straight into the....pit?
The flash produced would have set fire
To a caver up to his eyes in mire
The peaceful pause it could not last
And somewhere in that cavern vast
A spark set off that load of waste
Which flew past with enormous haste
And did the air down tunnels cram
Like some leviathan hydraulic ram
It caught the lads and stuffed them swift
Straight on up through Sharbutts rift.
They ended up in nearby quarry,
A trifle sore and very sorry.
The rammed-up cubic feet of air
Pushed out earth plugs for miles square,
And sent great flames towards the sky,
Making the pubs completely dry.
Albert, far from being sad and glum,
Began to sing and dance and hum,
Yelled, Quick, let's grab the action!,
Causing sighs and stupefaction.
He set about controlling flame
And applied for a company name
And now he sits and lives off perks,
Owning a central heating works.
The club was not forgot meanwhile:
We now do caves in warm dry style.

The Mechanical Tale of Nigel Leare

Refer to Engineers' Hole for the following tale, which also owes something (an apology?) to Alfie's The Ingenious Invention of Kenneth Lyle.

Mike O'Connor Vol.4 No.3 Dec.1976

This is the tale of Nigel Leare
Who was a caving engineer.
He did his best on Portland Isle
To bring about a larger pile.
Down a quarry he had a dig
With awe-inspiring entrance rig.
He'd found the place before
Whilst looking for a place to bore
A hole along a likely slot
And this had seemed a likely spot,
Full of choke he did admit
But hidden well in deep dark pit
Where quarrymen would see no spoil
Nor hear the sounds of frantic toil.
He dug and dug for months on end,
Creeping slowly round the bend.
The entrance of his fav'rite hole,
Though not for extraction of coal,
Looked more like head of Northern pits
With angly lumps of Winget bits,
A ladder here, a gantry there,
The shelved metal plates were where
He put his beer and sandwich box
To protect it from falling rocks.
One day fed up with digging mank,
He thought, It's time I went and drank.
So upping with his poking pole
He stuffed it in its resting hole
And shot off to nearest pub
Like sane-type members of the club.
As he sat sadly supping ale
Another caver, big and pale
Through lack of ale, approached our lad
Noticing that he looked sad,
And putting on a face forlorn
Said, It's your round lad, mine's all gorn!
A well-known member this chap too,
Long had he been in caving crew.
Like Nige he had another aim,
Model Engineering its name:
Steam engines his special forte,
Small and neat but really rorty.
What's up, he asked our lad Leare,
Drowned a ferret in your beer?
No, said Nigel, I'm in a fix.
Try the Doc., he has lots of tricks,
Said Norman, getting things all wrong.
No no, said Nige, It's got too long!
Good grief! said Norm and spilt his beer,
You haven't gone and come over queer!
No! choked Nigel, my dig's too hard,
Think I'll give up and chuck my card.
Don't do that, said Norman, not yet,
Thinking he'd better get the vet,
Warn all the club before you start
Indulging more in the caving art.
Then Norm he had a bright idea,
Don't give up, use some other gear.
Such as? said Nige, on his third ale,
A mini digger on a rail?
Yes that would do the trick, said Norm,

And on machines their thoughts did roam.
As pints went past the brainwave grew,
They penned with care what he should do.
So it was that Norman Screngin
Sold our Nige a new steam engine.
Into his shed he quickly ran,
Big tools hammered and small wheels span.
Gradually grew in that black hole
A mini mining mobile mole.
Six feet plus long by two feet wide,
With LEARY MOLE writ on one side,
Bike grips, and funnel at the back,
Twas meant to run on railway track
But it had tank tracks just in case,
And boiler and valves filled its space.
The whole job was engine-turned,
Polished bright it seemed it burned.
T'would dig a hole six feet by four,
Allowing room for cavers all.
Enlisting help for a pint or two
From thirsty members of the crew,
They lowered it by tripod rig
Straight on down to the start of dig.
Nige set up at furious pace
Close as possible to the face.
Steam pressure climbed slowly higher,
Until it came to time to try her.
Having quaffed pints at Nigel's cost
Club members braved the Christmas frost
And stood all round quite close by
(Well, five-hundred feet and not too high)
And waited. Nige, with upraised bottle,
Down came his hand upon the throttle.
The machine lurched and gave a creak,
The diggers whirled into a streak.
The mole dug with a climbing hum,
Which made our lad exceeding glum,
Cause mank and steam streamed at his mug,
Causing much thick and shrapnelled fug.
He lost his grip!- the mole clanked on
And in the fug was quickly gone.
Nige lay and grovelled on the floor,
His hands and face were feeling sore.
He sat and stared whilst fug it cleared:
Ahead, hole darkly disappeared.
The crew appeared, they cleaned him up,
Gave him bottles of beer to sup.
Word went round, they quickly gathered
Lights and kit and lengths of ladder.
They kitted up, Nige led off in
With clank of krabs and ammo-tin.
In fifteen yards they hit a cave,
Both left and right the passage gave.
The mole route went on six by four,
It crossed passages, many more.
A streamway they discovered too:
It looked like that in Swildon's Two.
Then they found an awesome deep pit,
Nige panicked at the sight of it,
And wildly grabbing at the walls,
Kicked Norman neatly in the .... jaws.
Norm went into a fearsome rage,
Looking like he'd escaped from cage.
Nigel lurched back in gnawing fear,
Straight over edge, whoosh, splash, oh dear!
Nige hit water, black, deep and cold,
And aged from young to very old.
Panic had him within its grasp
Before he hit that water vast,
And when he felt that icy grip
No murmer passed his whitened lip
As below surface he soon sank
Down to the bottom cold and dank.
That's when Nige found it two feet deep,
And sat up in a stranded heap.
From up above a yell came down,
Hey Nige, have you managed to drown?
A ladder clattered down the pit
And Norm came quickly down on it.
They glanced around and were aghast:
The chamber it was grim and vast.
The water it was going down
In swirls of silt all muddy brown,
For in the floor there was a hole
Dug on down by the mighty mole
At an angle - you could see it go -
Light filtered up from sea below.
And so it was in no time flat
That cavers at the entrance sat
Collecting money from grockles brave
For guiding people round the cave.
Nigel bought the entrance bit
And runs a show-cave through to pit.
The club they cave in all the rest
And a bar selling Bitter (Best).
Name? -ah the club have thought of this:
They call it NIGEL'S NEMESIS.

A Sandy Christmas

And now, from a Journal edition which suggested a Portland caves guide-book, something for the animal-lovers.... Rather prophetic, too, as in December 1991 two local cavers found their way down Sharbutts Rift - and couldn't find the exit. This and their tenuous surface-contact arrangements resulted in an MRO alert. A few other local cavers soon found them.

Mike O'Connor and Nigel Hewitt, *Jour. DCG.*, Vol.2 No.5 Dec.1972

Twas Christmas Eve in Sandy Hole,
With nary a sign of a Yuletide Mole,
Nor had there been for a week or more,
And little insects pale and poor

Slowly into vast Inkwell crept.
Sighing and shivering they quietly wept.
Pangs of hunger swept round the lair
And the woodlice offered up a prayer.
Let someone come, that's all we ask,
A caver in his muddy mask,
That he might leave within the cave
Some food, so we can try to save
A portion of our population
From dreaded Christmas-time starvation.
A ciggie butt, it would suffice,
Half a glucose tab, it would suffice.
But no-one came and time went past,
No sound disturbed that cavern vast.
Then suddenly there came a bang
And hope within the air did hang.
Yes, it was a sight to see:
Homesick lads of the DCG.
They couldn't stand to leave their cave,
And forsaking of an evening rave,
They'd set out for that lonely place
To do that hole at gentle pace,
Pausing on the round trip route
Wherever they could rest a boot,
Bringing with them Christmas cheer:
Mince pies, cigars and crates of beer.
Twice they stopped at the Inkwell,
And once in World's End as well.
There they ate and laughed and drank,
Dropping beer and crumbs in mank.
Finally they all lit cigars,
Creating fug like foul old cars.
The smoke became so dense and thick
That one or two were almost sick,
And retreating out of entrance way
Collapsed upon the surface clay.
With dirty torn up old tank suits
And all of them drunk as newts,
Leaving Sandy very much the same,
With thicker fug than when they came.
The insects thought that they had
Found Santa was a caving lad.
For they come with many a gift
Born on a sledge down Sharbutts Rift,
And they were left with piles of grub;
Cigar butts, pies and beer from club,
Which brought on much festive cheer
And drunken insects who fell in beer.
The food would now last them well
Till Nature cast its Springtime spell.
Meanwhile, outside, the DCG
Recovering from the revelry,
Attempted to get out via quarry
But ended looking rather sorry,
As every time they tried the face
It kept swaying at tremendous pace.
And so they spent Xmas Eve and morn
Waiting on the rocks, forlorn.
The moral of the story be,
For you homesick lads of the DCG:
(Wait for it - quick change of meter)
The Curse of Sandy thou will haunt,
It takes of festive cavers to taunt,
To trap them in forsaken places,
Denying them lecherous graces.
So festive cavers now pay heed
Lest the Curse of Sandy thou will bleed,
Robbing you of needed liquor.
So much your cave trip that much quicker
That for the minutes caving missed,
Thou will not exit in the least bit drunk?
Thus cutting chances of cavers forlorn,
Who spent all Xmas Eve and morn
Sat by the entrance of dear old Sandy,
Sobering up instead of drinking brandy.

Ode to Digging in North Passage, Sandy Hole

A. J. MacTavish Vol.1 No.4 Aug.1972

My knee's jammed in a crack,
There's a rock stuck up my back
And my left arm's gone a curious shade of blue;
It's difficult to hear
Now I've mud stuffed down one ear,
And I haven't seen my feet since half past two.
I've been lying on my tum
Till my guts have all gone numb,
And the oddest bits of me are getting sore.
I get that hemmed-in feeling
As me helmet bangs the ceiling
While my nose is being pressed against the floor.
In (perhaps) a day.....or week
You will hear me shout, Eurek....
....a! (Admittedly it might take me a year);
But when I find my cavern,
You yokels in the tavern
Had better start to setting up the beer.

Reference:

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Appendix 1

Sediment analysis, Engineers' Hole

The sediments of Engineers' Hole, a rectangular-section phreatic tube in a quarry face at Inmosthay, are distinctly layered. Much of the cave's chert seam roof failed, so large slabs of fallen chert lie within the sediments. This suggests that chert was dropping from the roof whilst the cave was still active, but beginning to lose its stream. The roof above shows minor solutional effects, attributable more to slow seepage water above the chert than to the main flow.

Mr E.D.K. Coombes analysed samples of the cave's sediments, collected by N. Graham, who assisted him in his research for his B.A. thesis on Portland's joint pattern and landslips (Coombes 1981).

Coombes identified small, rounded or sub-angular pebbles and fragments, comparable to those found by Prestwich in 1875, in a relict water course in a quarry. The materials were quartz pebbles, chert fragments attributed to the Greensand (not Cherty Series?), Tertiary flints (small, round pebbles) and similarly worn ironstone fragments. Ignition tests revealed traces of carbonaceous materials, by weight losses up to 5.8%.

A subsequent find is a very interesting water-lain deposit in an alcove on Westcliff face, at SY 682 721. Here the sediments grade upwards from gravels to fine silt, cemented probably by calcium carbonate and reinforced by being between vertical chert ribs. This deposit has yet to be properly assessed - let alone removed to prove the existence or otherwise of any cave passage.

Appendix 2

Surveys, original publications

This list gives the original publication references of surveys used in this book. Those original to this guide are designated as 1st.pub.

Other abbreviations:

D - Description. S - Survey. C - Cave. H - Hole. R - Rift.

Club names as in Introduction (p 8), with some abbreviations reduced to initials only for space.

Admiralty R. YAC 1990 1st. pub.

Australia R. DCG 1972 J.DCG (1) 6 D&S

Blacknor H. (1st) HSCCF 1975 J.DCG (3) 3 D

Blacknor H. (preliminary) HSCCF 1975 J.DCG (3) 4 S

Blacknor Hole. McTavish 1975 Descent 32 D&S

Cherty R. DCG 1975 J.DCG (3) 5 D&S

Crocodile Canyon. DCG 1971 J.DCG (1) 4 D&S

Flagpole R. WVS 1969 T.CRG (12) 4 D&S

do. J.DCG (1) 3 D&S

Fossil C. LUSS 1963 T.CRG (7) 1 D&S

do. LUSS/WVS 1963/1969 T.CRG (12) 4 D&S

do. J.DCG (1) 5 D&S

Gemini R. DCG 1973 J.DCG (2) 4 D&S

do. MSG 1983 C & C (22) S

Glow-Worm R. Y/W/I 1990 1st. pub.

Grove Cliff Cs. W/I 1987 J.WCC (19)216 D&S

do. Descent 92 D&S

Jewellery R. W/I 1991 1st. pub.

New Passage. WVS 1969 T.CRG (12) 4 D&S

do. J.DCG (2) 1 D&S

Perfidy C. Y/W/I 1990 1st. pub.

Persil R. WPVSU 1983 1st. pub.

Red Door Tunnel. W/I 1991 1st. pub.

St. Andrew's Well. W/I 1st. pub.

St. George's R. WVS 1969 T.CRG (12) 4 D&S

do. J.DCG (2) 3 D&S

Sand H. DCG 1976 J.DCG (4) 3 D&S

Sandy H. DCG 1971-2 J.DCG Saga only

Sandy H. MSG 1981 T.BCRA (10)3 1983

Sawmill C. LUSS 1963 T.CRG (7) 1 D&S

Steve's Endeavour R. MSG 1983 C & C (22) S

Walditch C. BCG 1987 Descent 82 D&S

Westcliff Cs. MSG 1983

do. MSG/WPVSU 1990 WPVSU / 1st.pub.

White River C. PdCG 1965? J.DCG (2) 5 D&S

Windy Dig. LUSS 1970 T.GRG (12) 4 D&S

do. WVS / DCG 1971 J.DCG (1) 2 D&S

NOTES:

We cannot be certain we have correctly attributed some of the earliest surveys, since they were either anonymous or signed by individuals. We offer our apologies to anyone thus affected.

Double attributions signify surveys revised and up-dated by the second club named, except those by W/I and Y/W/I (WCC, YAC and Independent) jointly.

Not all surveys listed are in this book, as the latest available have been used. Earlier work is listed for honour and completeness.

Several caves described in the main text have very vague histories, their descriptions appearing in the CRG Transactions, with no information on who actually first explored them. Some caves may not now have their original names, due to the lack of original publications, but any such name changes date back to the 1960s. PCG started a theme with Australia Rift, so a few other caves may originally have had Commonwealth-nation names. Recently, a few local cavers seem to have renamed some caves, purely from a lack of basic research. Such private names have been ignored!

Appendix 3

Coastal walk

It is possible to circumnavigate most of the island, the Verne and the military establishment at the Bill being virtually the only obstacles forcing inland detours. Partial tours are feasible, using cars or the regular buses.

Westcliff is open all the way from the Verne to the Bill. Pass the disused Upper Light(house) shortly before turning inland past the QinetiQ establishment. The Church Ope area is rather confusing, but the main paths are now signposted or fairly obvious. A detour to the road is enforced for a short distance.

The particularly rough (depending on tides) area of sea SE of the Bill is Portland Race, a region of strong, conflicting tidal currents.

Dorset generally offers excellent walking. The impressive and very varied coast path is part of the SW Peninsula Path. Its variety, of course, stems from its geology, a nearly-conformable succession from the Lias (in the west) all the way up to the Cretaceous and Tertiary (east). Inland, the Dorset Downs and west. Dorset hills and valleys offer rich rewards, particularly if you are reasonably exploration-minded. The E.Devon to E.Dorset coast is now a geological World Heritage Site, called somewhat misleadingly, the "Jurassic Coast" – it is of course, its *rocks* that are Jurassic, not the coast… where not Cretaceous.

Portland Museum, etc.

The Museum is well worth a visit, particularly for its stone trade history, and was a source of information for this book. The building itself was for a time, and was given by, Dr Marie Stopes, the palaeo-biologist better known for her pioneering work in women's health and family-planning. The military historian may also view the High-Angle Battery (see main text), the associated East Weares low-trajectory battery (6945 7405: just east of Royal Naval Cemetery) and Nothe Fort (Weymouth), which is a museum run by the Civic Trust, open in the tourist season. These fortifications are built of Portland Stone, including vast quantities of Roach blocks. Take a lamp for the first two buildings. Much older coastal defences are Portland Castle and Sandsfoot Castle (Wyke Regis), from Henry VIII's reign.

ACCOMMODATION ON PORTLAND

There are no campsites on Portland. Wild camping is not recommended as there are too many thieves and vandals about. Towed caravans are discouraged, as the narrow, steep, twisty, busy thoroughfare through Fortuneswell is the only route to Tophill. Motor caravans are less problematical, but note that they are barred from the Bill car-park after 10pm by Borough Council by-law even if the occupants have not the slightest intention of staying overnight there.

Unless you are day-visitors only (or local!), either use B&B houses, or the tourist campsites on the mainland. The nearest are at Wyke Regis and beyond Chickerell, to the west of Weymouth. These are on a convenient route to Portland, using the Abbotsbury to Weymouth B3157.

Appendix 4

Blast .... & Damn?? - quarry blasting effects on caves

Recently, fears were expressed that if a rescue results from a rock fall underground, the quarry owners might be blamed (by local residents opposed to the noisy and dusty aggregate extraction) for rendering the caves unstable by their blasting. Undeniably, caves within active quarries may be damaged so, but could distant caves be affected? The following makes some rather drastic assumptions and simplifications, but may be food for thought…

An explosion is a pressure wave, of very high intensity and rise time, which travels through any medium (air, water or solids like rock) in much the same way as sound does. Similarly, its force will be attenuated by distance from its source - the explosion - according to the inverse square law governing any radiated energy. If the pressure is at half its original pressure (P) 2m from the explosion, it will be at P/4 4m away, P/16 8m away and so on. The calculations use 1m from the source as the origin to avoid trying to multiply by zero. (1m from an explosion is close enough anyway!)

So for instance, by the time the shock wave has travelled 1000m to Sandy Hole from the centre of either Suckthumb or Bowers Quarries (the nearest to Westcliff), it will be reduced to less than 1/1000 of its original power (or by 60dB).

This assumes the shock travels through a single, homogeneous, joint-free rock of constant density. Yet we know Portland's limestones are a set of beds of varying consistencies, thicknesses and bedding-plane fillings, divided by a network of air-filled joints from a few mm to a metre or more wide. Above the stone are marls and Slatts, below is clay. Between the active quarries and the caves are old quarries of various depths, some filled with mixed stones and soil. No pressure-wave will travel through that lot, without further major attenuation by absorption, diffraction and reflections from the masses of discontinuities.

A shock wave travelling along a narrow cave passage can cause damage for a considerable distance. It may not break the wall rock, but it could dislodge loose boulders and fell formations. However, no known Portland cave has any open link with any active quarry (unless actually within the quarry). Anyway, the NNE-SSW main joints between the active quarries and the main caves would probably reflect the shock wave safely away.

Think of any cave you may visited in a Carboniferous Limestone aggregate quarry which used heavier charges than those likely on Portland. The passages close to the quarry face are shattered and ruckles further in may be loosened, but the worst damage is in a relatively narrow zone behind the face.

There are loose boulders in Portland caves, but except perhaps in rifts in quarries using explosives, blame Nature, not the quarrymen. Caves in old dimension-stone quarries (*e.g.* Fossil Cave) are pretty solid because the stone was removed mechanically.

In other words, the rumoured fears are, well, groundless....

Appendix 5

References

Two groups share the honours for the main geological studies of Portland Caves, the University of Leicester (1964) and the Moldywarps Speleological Group (1980s). The geologists concerned are primarily Dr Trevor Ford and Malcolm Hooper and Dr Roger Cooper (Dorset Institute of Higher Education), respectively.

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Trans. BCRA is the formal title of Cave Science.

Mr Coombes' B.A. thesis comprehensively maps the major joints of Portland. Coombes points to the local landslips' rotations: initially top outwards, rather than the top inwards typical of slides in clay, etc., strata.

Dr Cooper gives very full bibliographies in his papers. The references in Studies in Speleology is a major international list of papers on Mass-Movement Caves and a selection of these references is included above. The texts themselves provide detailed explanations of mass-movement features, drawing on widespread examples in various rocks.

Dr Ford (1988) examines the rippled surfaces of speleothems, showing the uniform wavelengths of the ripples, which may form micro-gours. He discusses various theories, none of which seem to be definitive and invites further studies, asking if the serrations on curtains are a similar phenomenon. The article (in Forum section) is illustrated with four photographs, including two from Portland.

Chris Proctor (1988) shows the history of the Tertiary and later marine erosion of Berry Head and considers the phreatic caves there to have been shallow freshwater lens features developed just below interglacial erosion platforms. Phreatic rifts are considered to show the effect of changing sea-levels. This reference is included as it may point to further investigation of some Portland caves' histories, particularly in view of the Raised Beach sea level and the suggested variations in water flow in certain caves.

John Perkins' Geology Explained.... is a useful text for the amateur geologist without an especially deep knowledge of the subject. Despite its title, it concentrates on the coast, although this does cover almost every rock type found in the county. It assumes a basic understanding of geological mechanisms and of geological maps.

Weeks (1993) was kindly made available for study by the Borough Engineers' Department of Weymouth & Portland Borough Council, at its offices. It comprises 2 volumes. Vol. 1 is the geology survey results referred to here. Vol. 2 is the proposed new road design and observations on its building.

The papers describing Yorkshire Dales features are included to give comparisons between the two areas, both having near-horizontal, fairly thickly-bedded limestones.

Anon. (Dorset Evening Echo was one of several items on unidentified tremors felt by residents of Tillycoombe (nowhere else?) since 1986. Initially blaming quarrying failed as did the Borough Council's investigation and the whole affair faded away! Some locals blamed the MoD for alleged underground works (denied). Tilleycoombe is the valley below the west slopes of the Verne and may have undergone minor earth movements.

El-Shahat and West (1983), and West (1979) explain the replacement of gypsum evaporite and shell aragonite by other Calcium and silica compounds, including chert. Although they investigated deposition and subsequent lithological chemistry, their papers may provide a pointer to the initial speleogenesis, in view of Edmunds and Schaeffer (1932), Ford and Hooper (1964) and Lowe (pers. comm and 1992).

Nicola Williams (1992) and Geneviève Walshaw (1993) studied landslips in the undercliffs and eweares, the latter examining the wildlife on, as well as the geology of, the tumbled slopes.