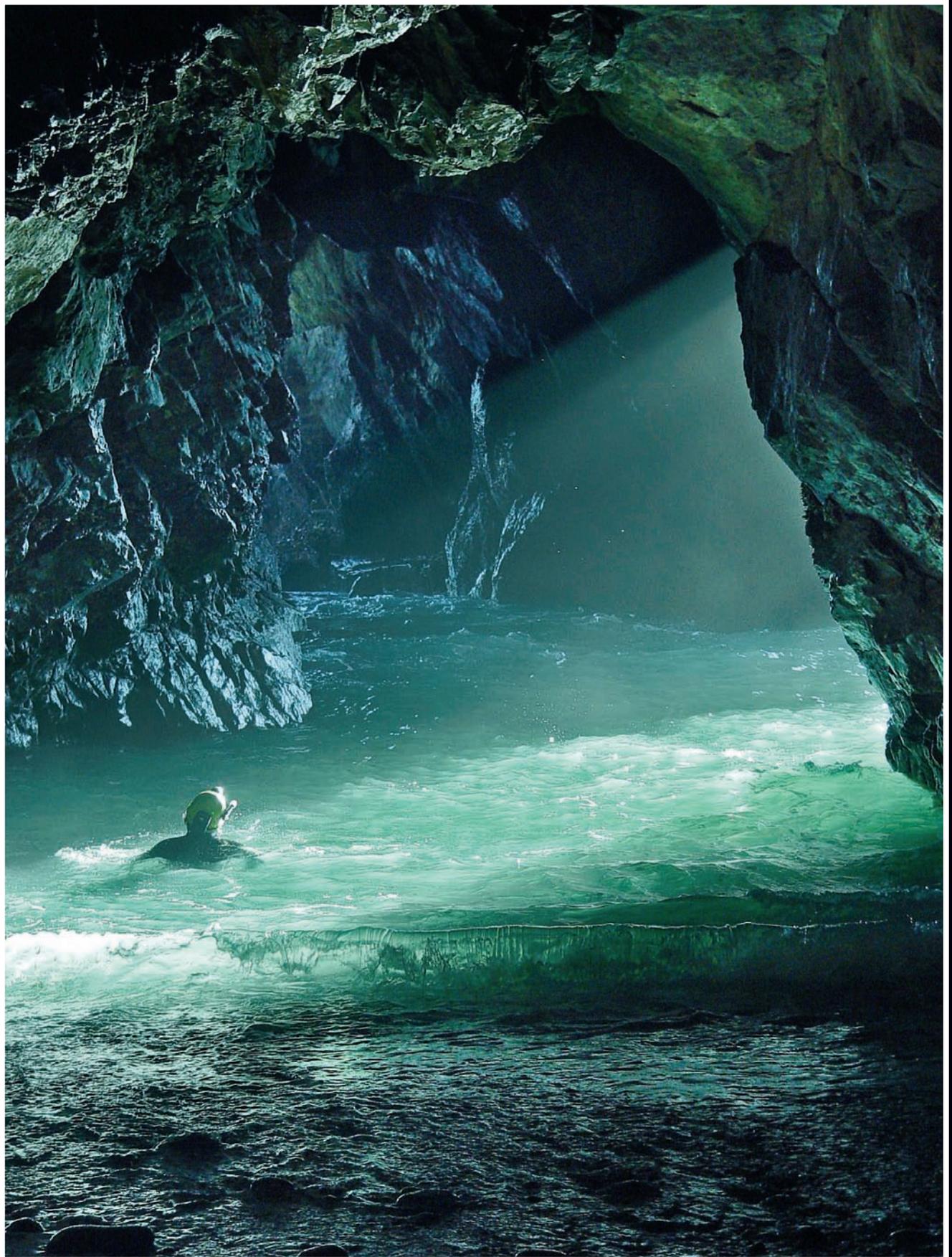


NSS NEWS

October 2008



Vertical Sea Caving

Dave Bunnell¹

Our March, 2007 issue featured a caver rappelling over a sea cave arch. While many sea caves are probably much more easily accessed by rappelling down a cliff to reach them, in only a few instances can one actually rappel IN to them. Vertical entrances to sea caves are a rare phenomenon. But with over 20+ years of surveying hundreds of sea caves, I've encountered and surveyed some fairly spectacular ones.

Littoral pseudokarst, which is ultimately a product of marine erosion, is most typically characterized by the littoral sinkhole. This is simply an opening to the surface formed by collapse or gradual erosion into a sea cave chamber or passage beneath. Unlike its kin in soluble rocks, the littoral sink almost always forms by erosion and collapse rather than dissolution. I've never noted shallow, doline-like features above sea caves, though I've not seen many sea caves in soluble rocks. In most cases the author has observed, the cave chamber in question has a seaward entrance and the collapse tends to occur at the most distal region of the cave. Sinkholes have formed in both sedimentary and volcanic rocks.

Two other names commonly applied to littoral sinkholes are "punchbowls" and "blowholes." The latter term more properly applies to caves that eject spray with incoming waves, a phenomenon dependent on both tide level and swell conditions. It may occur through either a passage constriction in a single-entrance cave (such as the famous "La Bufadora" near Ensenada in Baja, Mexico) or through small openings in sea cave roofs. The latter process will obviously tend to enlarge such an opening over time. I recently described such a feature in Samoa, where a woman had fallen into a sink opening into the middle of a cave (4). In this cave the sink filled with water but didn't eject, geyser-like, into the sky (at least, under normal sea conditions). Most news accounts referred to it as a "blowhole," however, no doubt to emphasize the severe conditions the woman had to contend with. Not having seen it, I also can't say whether this was a skylight collapse into a lava tube or a collapse into a wave-cut cave, which is my focus here. But there are apparently a number of such features on Samoa.

In the course of surveying sea caves in California, Hawaii, and other parts of the

world, I've encountered some very impressive littoral sinkholes, some of them akin to the open-air pits of TAG, albeit not nearly so deep. Indeed, the very first cave we surveyed in California (Caverns of Mystery in Shell Beach, California) had such an entrance, with a 45-foot sheer drop to the floor possible. This is my first attempt, perhaps anybody's, to compile a list of known sea caves with these features. For each entry in the table on page 12 I've determined diameter of the collapse, the rough area of the opening, the depth of the drop, and the cave's overall length.

MENDOCINO COUNTY, CALIFORNIA

Bill Halliday, in his description of the caves of Mendocino County in *Caves of California*, described the county as being "the most extensive locality of littoral pseudokarst on the Pacific coast." As near as I've determined, he is quite right in that assessment, though Santa Rosa Island, as noted below, comes close.

By my reckoning there are six, possibly seven major littoral sinks associated with caves in Mendocino. Two are quite accessible. There is a hundred-foot-diameter, circular collapse pit, 70-feet deep, into a sea cave at Russian Gulch State Park. We haven't sought permission to rappel into this for a survey, especially since the sea tends to be so rough here. But the cave passage leading into it covers 250 feet, based on surface survey by Bruce Rogers (5), who noted that the predominant rock type in this area is a "Cretaceous-age Franciscan terrane graywacke and the cave is formed along a series of prominent near vertical joints." From the photo on page 16 it is clear that the bedrock does not extend all the way to the surface, which probably helps account for its depth. Also seen by many tourists, the punchbowl at Mendocino Headlands State Park is an impressive feature with a 40+ foot freefall drop to the water below. Three of us donned wetsuits one Fall day, climbed down the cliffs on one end of the headlands, and surveyed the cave to a length of 233 feet. This one is somewhat unusual in that it is in the middle of a passage that opens at both ends. We had fun during the survey while waving at tourists looking down at us from the hole above.

Another monster sink, similar in size and depth to the one at Russian Gulch, is found on the south side of Little River. A group of us from the Mother Lode Grotto along with local caver Derek Hoyle surveyed this over the course of three trips (it was too rough to finish the first visit). This is perhaps the best



Descending into a sea cave pit at the rear of a cove in Shell Beach, CA

surveyed littoral sink we have (see page 15) since a surface survey circumnavigates it. It is 130 x 120 feet and 70 feet deep. This one has a lot of slope to it, as much of it is walled only in soil. Indeed, only the side leading into the cave shows much bedrock, and it extends only about halfway up the side. This is a very popular attraction with the locals, who sometimes use a knotted clothesline to reach the bottom. A group of them who arrived during our survey was certainly amused by our overly-cautious descent with helmets and full vertical gear on proper rope, but disappointed that we had no beer to share...

The view from the back is very impressive, with two large tunnels intersecting to form the main cave. A sunbeam enters from the righthand tunnel and lights up the interior of the cave nicely. Entering a sea cave from its back end isn't something you can do in many places, and in fact, the view afforded by this sink access would be unlikely on any but a few especially calm days at this spot. It's one of the more scenic sea caves I've visited and one of the best "sport vertical" sea cave trips around.

There are three more sites in Mendocino where I've observed large littoral sinks, but access for survey may be problematic. One of these is visible on the tip of Point Arena from the lighthouse. We haven't approached the coast guard about letting us rappel into that one, which is a cave perhaps more pit than cave. I also located what may be a possible double-sink cave just south of here, on Google Earth, while preparing this article! One of these may be an intermediate stage between partial and full collapse, something I haven't seen elsewhere. The third site is a sink on the peninsula at Fort Bragg, but on

¹ Photos were taken by the author unless otherwise credited.

private property. We hope to survey some of these in the future.

There are numerous circular coves along the Mendocino coast which may well have resulted from the collapse of other littoral sinks over time.

ELSEWHERE IN CALIFORNIA

Caves with littoral sinks are comparatively rare in the rest of California. One such cave is found in each of 3 counties, San Diego, San Luis Obispo, and Santa Cruz.

San Diego's Sunset Cliffs region is pock-marked with a dense series of caves. On the bluffs above is a strikingly circular collapse pit surrounded by a fence, just a stone's throw from Sunset Cliffs Boulevard. It drops about 40 feet into a short sea cave with a single seaward entrance. The cave is in thin-bedded marine siltstones and sandstones known as the Point Loma formation, and formed along vertical joints. Further north, a larger littoral sink known as the Devil's Pot was a tourist attraction for many years, and is pictured on a 1910 hand-colored postcard. It collapsed, well before our surveys of adjacent sea caves in the early 1980s, leaving a circular cove.

San Luis Obispo is a very sea cave-rich county in central California. At Shell Beach is a prominent collapse into a sea cave with two entrances, in what is today known as Margo Dodd park. This cave was once commercialized under the name "Caverns of Mystery" (postcards from there date to 1948) and there are steps leading down one side of the sink into a chamber with two entrances. One leads into a circular cove that may well be collapse of a former portion of the cave. A few tenths of a mile away, back in 1986,

we had rappelled into another cave indented into a cove. As a testament to erosion rates here, much of this cave and the cove itself seem to have vanished in storms in the intervening years. At least, they don't show on either Google Earth or the California Coastal Project's detailed aerial images of the coast. These caves are in colorful Pleistocene sandstones.

A cave in Santa Cruz near Davenport (Basketball, see map in ref. #3) has what might be early-stage littoral sinkholes with two separate but small vertical entrances in addition to its seaward entrance. In this case it is probably more a case of the hillside above the cave having eroded into the cave, rather than a collapse driven by removal of material below. A small entrance at the very top yields a rappel through a small hole 40 feet to the floor of the cave. Depending on the tide level, this may be a sandy beach or thrashing surf, so one must be prepared to do a changover! A more recent second collapse on the side of the cave wall yielded a 15-foot drop. This cave is in sedimentary marine mudstones and siltstones.

CALIFORNIA CHANNEL ISLANDS

Several of California's Channel islands contain numerous large and significant sea caves, the largest of them in basalt and others in sedimentary rocks. No littoral sinks are known on Santa Cruz Island (which contains the largest caves), but virtually all of its caves are in basalt, with often 100 feet or more of host rock overburden. Anacapa Island hosts one cave with a littoral sink resulting from the collapse of about a third of the cave's passage, pessimistically named Half

Gone. The seacliffs here are only some 50 feet high, so the cave had developed ceilings high enough to intersect the surface. Unfortunately, in the days of Coast Guard operation this sink was seen as a convenient trash dump. Aside from two on Kauai, discussed below, this is the only littoral sink seen in igneous rocks.

Santa Rosa Island, which has caves in a variety of sedimentary marine rocks, hosts four caves with littoral sinks, three of them quite sizable. These three are on the north shore, the two biggest on the most wave-battered portions of the island. One is on the south shore, and subject to the southeast swell that sometimes develops. We've managed to survey all of these caves: Becher's Chasm, Puente Lobos, Revelations, and the Witch's Cauldron. Two of these are strikingly circular. Witch's Cauldron is the most complex, with tunnels feeding off in three directions (four, if you count the portion accessed beneath the natural bridge forming the seaward side of the sink). Puente Lobos and Revelation are in sedimentary rocks and both have impressive sinks. Becher's Chasm, the only one in basalt, has the smallest of openings and the shortest drop to the water.

OREGON COAST

Two state parks in Oregon feature littoral sinks as part of their attraction. The Devil's Punchbowl lies in a state park 8 miles north of Newport. It is a nearly circular collapse into a chamber measuring about 90x80, with three separate short tunnels opening to the ocean. No doubt the presence of so many points of attack helped

Table 1: Caves with pit entrances. NS=not surveyed. Pit diameters estimated from aerial photos.

Cave Name	Location	Diameter (feet)	area (sf)	Depth (feet)	Surveyed Length
Little River Pit	Mendocino County, CA	166 x 150	24,900	78	365
Mendocino Punchbowl	Mendocino County, CA	46 x 40	1,840	40	233
Point Arena Lighthouse	Mendocino County, CA	153 x 96	14,688	?	NS
Double Sinks	Mendocino County, CA	97 x 86	8,342	?	NS
Russian Gulch Pit	Mendocino County, CA	130 x 120	15,600	~70	~250
Ft. Bragg Mill Pit	Mendocino County, CA	75 x 52	3,900	~60	NS
Basketball Cave	Santa Cruz County, CA	5 x 3	15	50	220
Big Blowhole Cave	San Diego County, CA	30 x 30	900	35	92
Caverns of Mystery	San Luis Obispo County, CA	52 x 46	2,392	30	230
Fault Cove Cave	San Luis Obispo County, CA	20 x 10	200	60/12	230
Half Gone Cave	Anacapa Island, CA	62 x 21	1,302	~40	279
Becher's Chasm	Santa Rosa Island, CA	40 x 15	600	20	187
Puente Lobos Cave	Santa Rosa Island, CA	130 x 100	13,000	32	250
Revelation Cave	Santa Rosa Island, CA	150 x 135	20,250	50	230
Witches's Caldron	Santa Rosa Island, CA	112 x 86	9,632	28	455
Waiahuakua Cave	Kauai, Hawaii	24 x 20	480	65	1155
Queen's Bath	Kauai, Hawaii	214 x 157	33,598	65+	369
Devil's Punchbowl	Oregon	87 x 82	7,134	70	NS
Boardman SP	Oregon	203 x 181	37,648	?	NS
Punakaiki Punchbowl	South Island, New Zealand	135 x 55	7,425	97	NS
Whenuakura Island	North Island, New Zealand	60 x 30	1,800	40	~150', NS

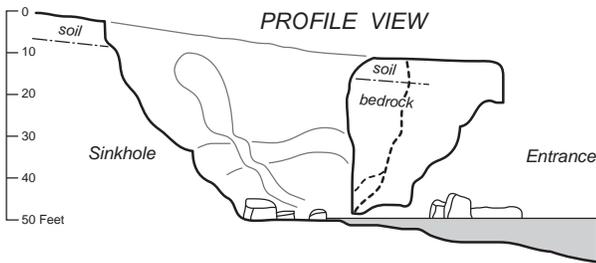
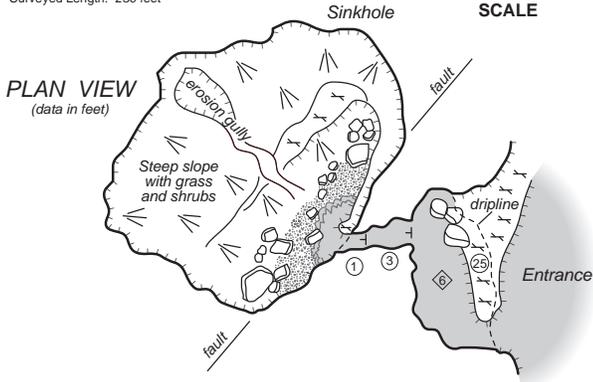
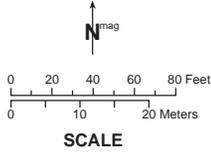
REVELATION CAVE

Santa Rosa Island, California

Compass and Tape Survey by:

Dave Bunnell, Phil Darling, Ernie Garza,
Susan Hammersmith, Don Morris, Nancy Pistole.

Survey Date: September 10, 1990 at low tide
Surveyed Length: 230 feet



SR1 - F1

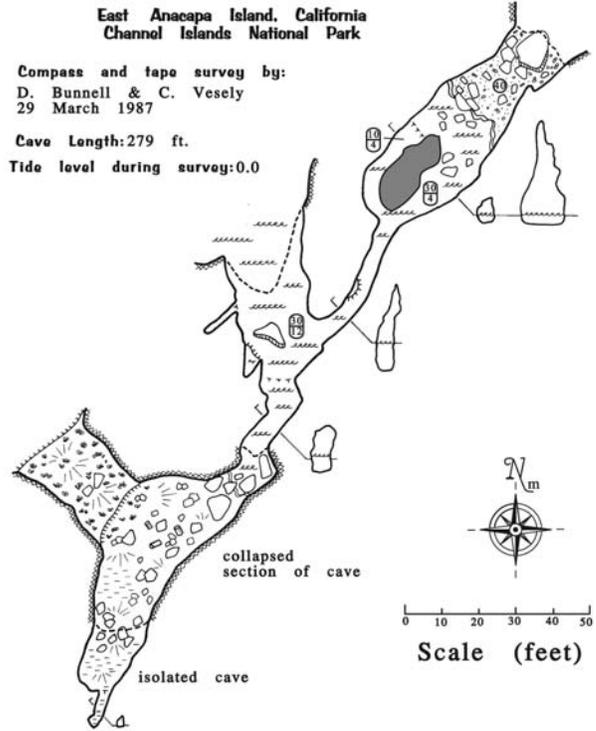
©2008, California Sea Cave Survey
Cartography by Bob Richards

HALF-GONE CAVE

East Anacapa Island, California
Channel Islands National Park

Compass and tape survey by:
D. Bunnell & C. Vesely
29 March 1987

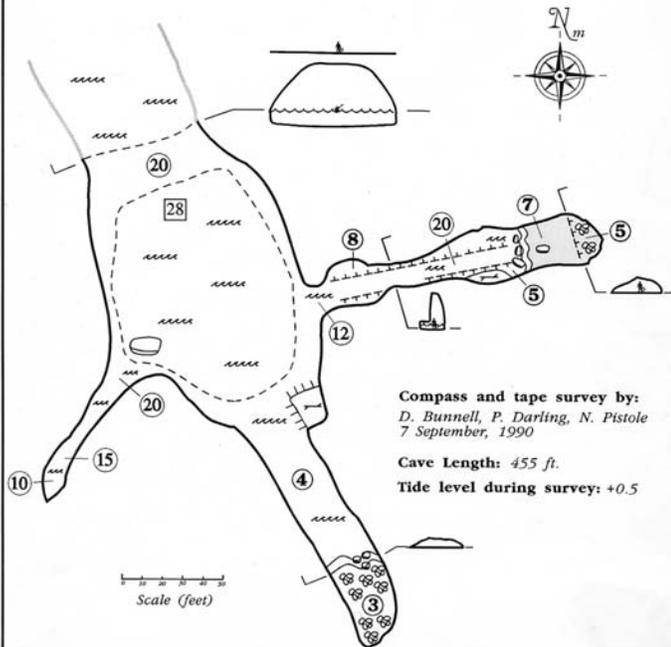
Cave Length: 279 ft.
Tide level during survey: 0.0



Produced by Carol Vesely

WITCH'S CAULDRON

Santa Rosa Island, California
Channel Islands National Park

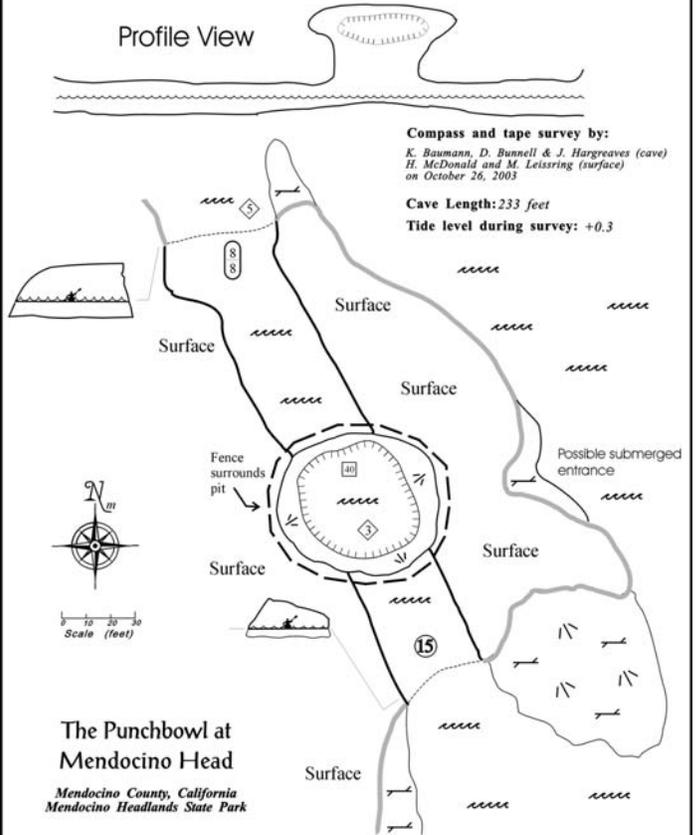


Compass and tape survey by:
D. Bunnell, P. Darling, N. Pistole
7 September, 1990

Cave Length: 455 ft.
Tide level during survey: +0.5

Produced by Dave Bunnell

Profile View

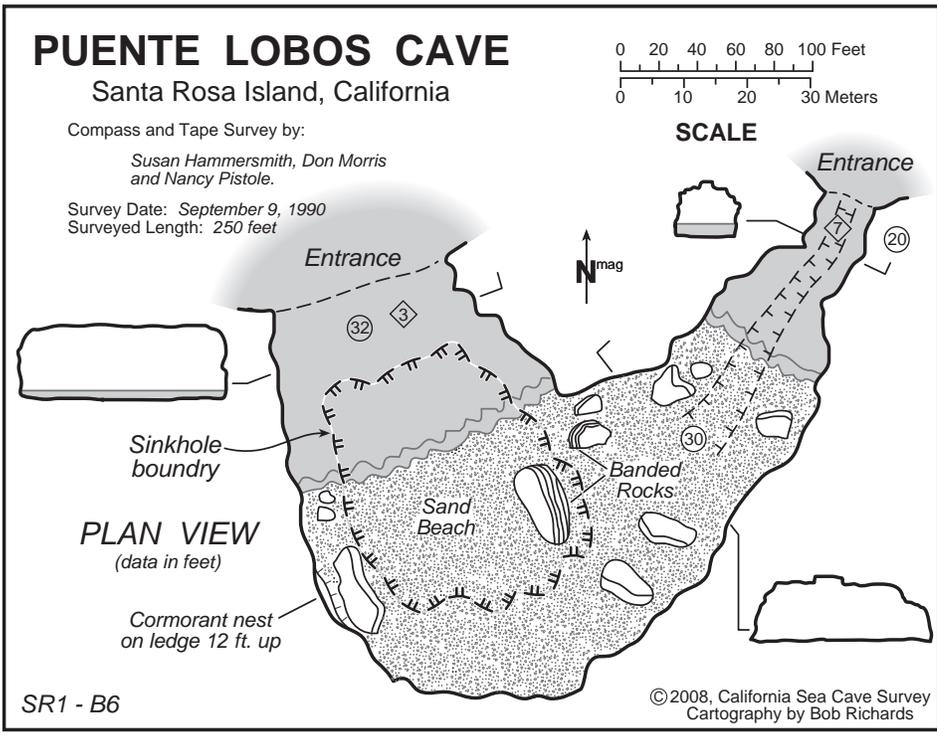


Compass and tape survey by:
K. Baumann, D. Bunnell & J. Hargreaves (cave)
H. McDonald and M. Leissring (surface)
on October 26, 2003

Cave Length: 233 feet
Tide level during survey: +0.3

The Punchbowl at Mendocino Head

Mendocino County, California
Mendocino Headlands State Park



enlarge the chamber that formed it. What is especially striking about this collapse is the sheer vertical walls on all sides, adorned with colorful orange lichens. My guess for depth is at about 50 to 60 feet, lacking a survey, based on estimates from a visit to the bottom of it during a low tide in the 90s. It has developed in sandstone.

Another very impressive littoral sink can be seen from a trail in Samuel Boardman State Park in southern Oregon. While I've viewed this one personally, I have no survey data for it. From my photos, I'd estimate this one to be at least 125 to 150 feet across, so it is one of the major littoral sinks. According to geological information at the park, the sink, along with some 7 distinct arches and tunnels here, were all part of one long sea cave before it collapsed. It would be interesting to do a coastal survey that incorporated all these features, to see if they line up.

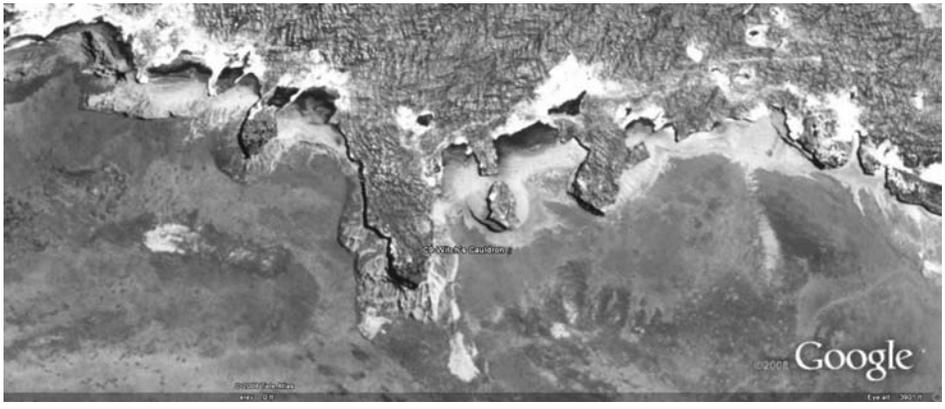
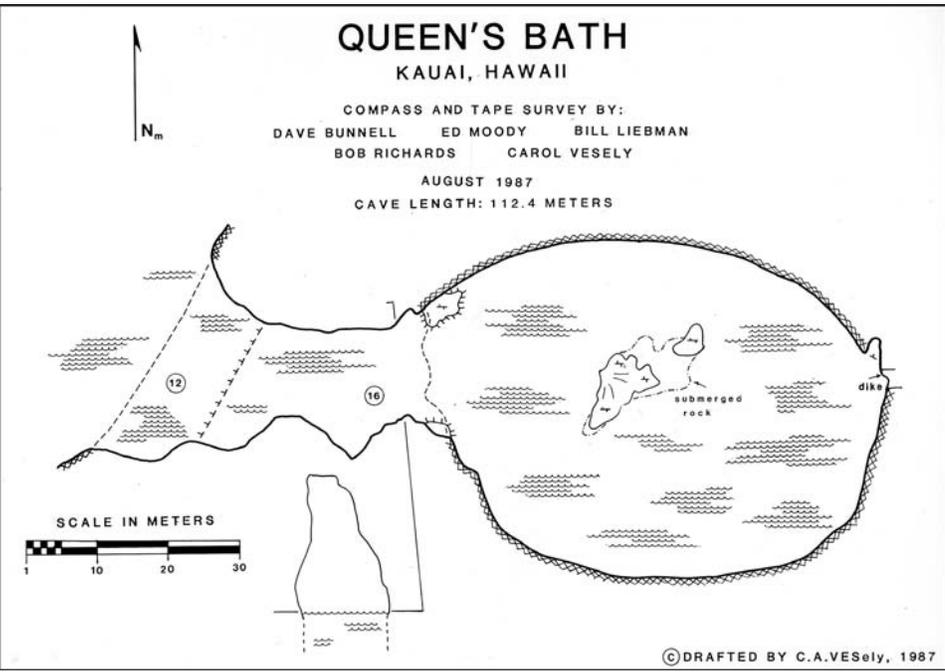
KAUAI

Kauai's Na Pali coast is famous for its rugged beauty and large sea caves. In 1987 I led a small expedition here to map some of these (1). Two of them are notable for littoral sinks. The Queen's Bath is perhaps the most impressive littoral sink in the world by all measures. It looks like a perfect circular shaft, 150 feet in diameter, bored roughly 70 feet through the basalt into a sea cave below. The bedrock here extends the full height of the shaft, which makes it all the more impressive. There's no easy access to the top, but access to the cave below is readily made by large boats from its single wave-cut entrance, and is a popular destination for guided Zodiac tours and sea kayakers. The opening into the chamber is only about 20 feet high, so one wonders how such a tall chamber could have formed beyond. In the center there is a bit of breakdown, but clearly most of the material has been carried away by the huge winter surf that pummels this area.

Another popular cave along this coast is Waiahuakua, or "Sacred Water Cave." Some 200 feet into the cave, a waterfall tumbles 60 feet through a skylight opening. At times, a shaft of sunlight beams into the cave through it, making for an unforgettable sight. The cave forms a large "U" and has a second entrance just to the west. This cave rivals Painted Cave as one of the world's largest sea caves at 1155 feet in length and is by far the largest with a pit entrance!

THE BRITISH ISLES

Smoo Cave, on the coast of Scotland, is a karst cave which has been enlarged by wave action, and has a very large and scenic entrance. It has a collapsed skylight opening in its second chamber which admits a waterfall over 25 meters high. However, since this chamber was formed by dissolution, I have



Portion of Santa Rosa Island showing the Witch's Cauldron. Note other circular coves adjacent, possibly former seacaves now collapsed. Were they once littoral sinks?



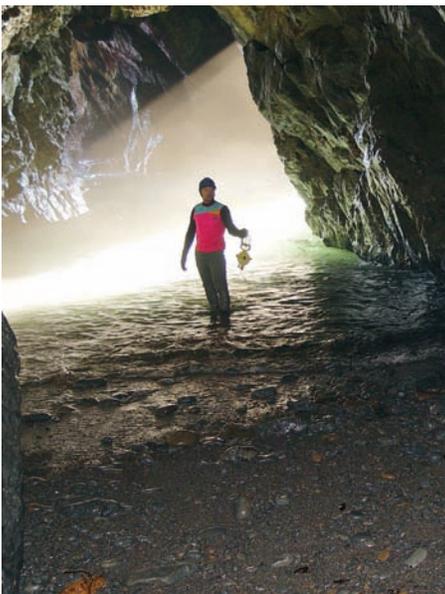
View of the pit at Little River. Note absence of bedrock other than on the wall leading to the cave, righthand side of photo.



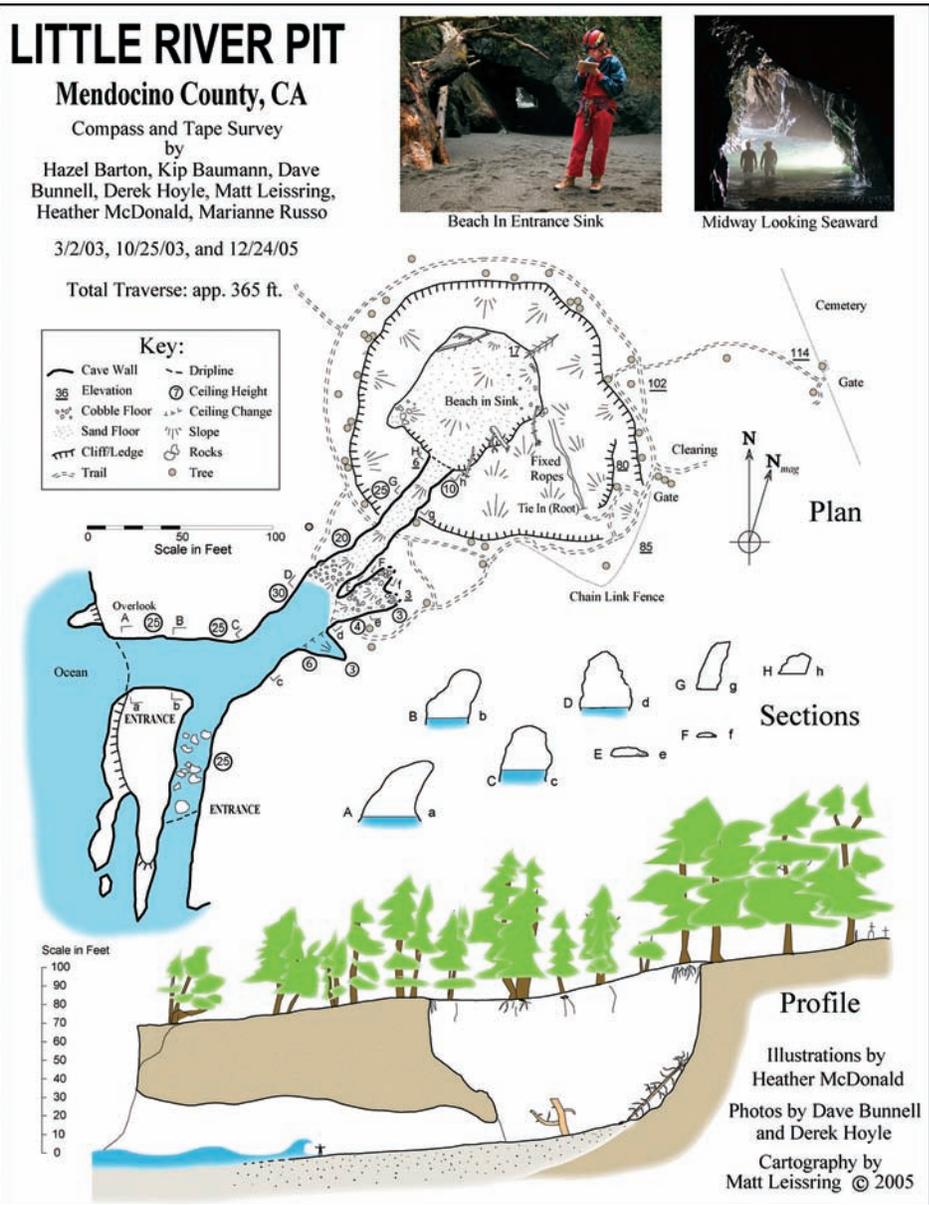
Little River Pit



Little River Pit, photo by Derek Hoyle



Ric Gates brandishes the survey tape in Little River Pit, photo by Derek Hoyle



Matt Leissing's map won an Honorable Mention in the 2006 NSS cartographic Salon



Rough survey conditions in Little River Pit



This littoral sink at Boardman State Park in southern Oregon, is apparently a portion of a much larger cave system now mostly collapsed.



The impressive Devil's Punchbowl is the centerpiece of an Oregon State Park. Three separate tunnels intersect it.



Large-diameter sink at Russian Gulch State Park, Mendocino County, California. Two separate passages connect into it.



The "punchbowl" on the south side of the headlands in Mendocino Headlands State Park, Mendocino County, California



Rectangular collapse sink at Punakaiki in New Zealand is formed in dolomite. Such features are rare in carbonate coastal rocks..



Punchbowl occupying the center of Whenuakura, a small island off the east coast of New Zealand's North Island



Puente Lobos Cave on Santa Rosa Island, California has formed in sandstone.



The Witch's Cauldron, on Santa Rosa Island, California



Revelation Cave on Santa Rosa Island, California



Big Blowhole Cave in the Sunset Cliffs region of San Diego, CA



The Queen's Bath, on the Na Pali coast of Kauai, formed in basalt and is almost 70-feet deep.



A perennial waterfall tumbles through a littoral sink in Waiahuakua Cave on the Na Pali coast of Kauai. Photo by Bob Richards.



Skylight entrance to Becher's Chasm, Santa Rosa Island, California

not included this famous cave in my table of littoral sinkholes.

Ballyunion Cave on Kerry Head, Ireland, is said to have a small littoral sink inside (Bill Halliday).

NEW ZEALAND:

In New Zealand I observed a couple of large and very impressive littoral sinks. One of these is in a tourist attraction known as the Pancake Rocks, at Punakaiki on the west coast of the south island. This is a scenic spot on a dolomite headland, and the rocks have weathered into fin-like shapes with the layering on the thin-bedded dolomite making a pattern of parallel lines across the surface. I didn't note many sea caves here except for several short tunnels coming into a granddaddy littoral sink. I can only estimate the depth and dimension based on the accompanying photo (page 16), as we didn't survey it and it's a low-rez region on Google Earth. Using the measure tool in Photoshop, I come up with 135x55 feet for this feature and about 90 feet deep, making it one of the deepest of the littoral pits. It also has a strikingly rectilinear character to it, which might reflect pre-existing perpendicular joints in the dolomite. In contrast to all the other caves mentioned here, this is the only one in soluble rocks. Dissolution may thus have played a role in its formation

On the eastern shore of New Zealand's south island, near the town of Whangamata, there is a group of four islands very close to shore. All of them are heavily forested and relatively unimpressive as islands go. But one



Looking into the pit entrance of the Caverns of Mystery, Shell Beach, CA

of them, Whenuakura (about 700x516 feet), has a surprise hidden inside. A 3,000-foot paddle to its southeast corner reveals a sea cave, hidden from view of those on shore. It's a spacious tunnel, some 25-feet high, and 30-feet wide, that goes about 100 feet before opening to a sunny beach hidden inside the middle of the island! This donut island is not unlike some of the great "hong" or hollow islands in Thailand's Phang Nga Bay. These latter, though, are in soluble rock and probably formed by collapse into solutional caves. This was the first such feature I've seen on an island in insoluble rocks.

(concluded on page 31)



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Dave Everton remembers a call one day from Sam Frushour with news that he had found "the perfect cave." The call was followed by an e-mail that included a picture of Drew Packman standing in an enticingly large entrance. The Indiana Geological Survey, for whom Packman and Frushour work, had gotten a call from a landowner asking about a drill bit they had found in a cave on their property. It seems the cave had been closed by rubble until the late 1990s, when the owner used a backhoe to reopen it. Family members had explored the cave, but wanted it mapped. Did the IGS know of anyone that could map it for them?

The cave entrance, right at the sandstone-limestone contact, is a large spring alcove with a small stream coursing out of its entrance and crossing under a nearby road. It had been used as a water supply in the past, and much of the old piping and a holding tank remained in a nearby stream bed. The entrance is impressive enough, measuring 10 feet high by 25 feet wide. Immediately inside it narrows to 5 feet high by 7 feet wide, then lowers to 3 to 4 feet high with sections requiring a belly crawl. At joint intersections the cave expands spaciouly to 10 to 20 feet high. Throughout its length a shallow stream flows, mostly ankle deep but reaching 1 to 2 feet deep in several spots.

The survey was begun on December 2, 2006, with Mike Drake, Pat Mudd, and Everton booking 700 feet in four hours. The second trip took place on April 28, 2007, with Everton, Mudd, and Al Clemons forming the team. A bum Suunto prevented any surveying, but didn't stop "previewing" the cave and the discovery of an estimated 1,200 feet of additional passage. Despite a post-scoop lack of enthusiasm to finish the project, Everton eventually returned with Mudd, Drake, Kevin Smith, and Ellen Jameson to complete the survey on September 2, 2007.

The Martin County, Indiana, cave was named **Clifton Spring Cave**. Everton declared it finished at 1,990 feet, though he mentions a tight crawl and dig at its extreme upstream end that was not pushed. Everton also drew the accompanying map.

Connel Cemetery Cave completes the issue, with a report by James Adler and a map of the new find by Jennifer Lyon Adler, her first cartographic effort. James had heard of the cave through a relative, who had recently acquired property nearby. James and Jennifer were joined by Mark Adler for the survey.

James describes the cave as straightforward and fairly typical for the area, with mostly crawling passage, the occasional

speleothem, and few nice standing-height domes sprinkled into the mix. The most interesting features of the cave are its numerous bear wallows, which have also been found in other nearby caves. The survey of the Martin County cave was completed on December 21, 2002, with the cave taping out at 578 feet.

Karst Chronicle

Summer 2008

Mid-Atlantic Karst Conservancy

A remapping project of **Lincoln Caverns** and nearby **Whisper Rocks** has been completed, culminating a four year effort by members of the Mid-Atlantic Karst Conservancy. The well-decorated Huntingdon County, Pennsylvania, caves are open for public tours, with Lincoln Caverns having long been a vacationer's favorite. The resurvey has made Whisper Rocks the seventh longest cave in the county with its total surveyed length of 1,782 feet, and Lincoln Caverns the ninth longest with 1,406 feet of passage.

During the survey, Tim Long, Todd Hancock, and other members of the Juniata College Outing Club began working several digs in Whisper Rock, hoping for a breakthrough to new cave and major discoveries. The work was messy and hard, and hundreds of buckets of goeey mud had to be carefully carried out along tourist trails, up stairways, and out the cave entrance. They found an additional 600 feet of virgin cave, but it won't be on the tour—it requires a belly crawl with an ear dip in very low and wet passage.

Vertical Sea Caving

(continued from page 18)

CONCLUSION

One thing that became apparent from making this compilation is that most of these features are found in sedimentary rocks, with the minor exception that perhaps the most impressive one of all is found in basalt! Often they are in places where passages converge, which certainly favors formation of larger and taller chambers. They tend to occur in the more distal part of caves, but this may become a chicken or egg question since the collapse of the roof likely affords a barrier to landward penetration of a sea cave for some time. The collapse can be either by erosion from beneath (probably the primary factor) or by erosion of the land above the cave, just as in limestone caves. Since the processes may be very similar, the term "pseudokarst" fits them very aptly.

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Thanks to all those who helped with the surveys over the last 25 years and especially to Bob Richards for preparing some of the accompanying maps on short notice.

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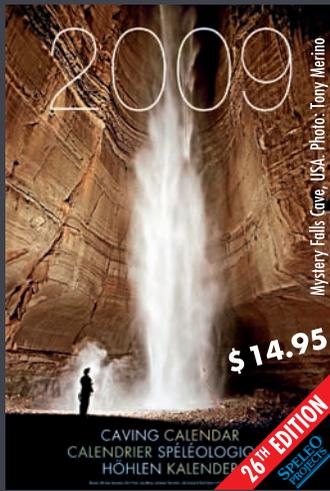
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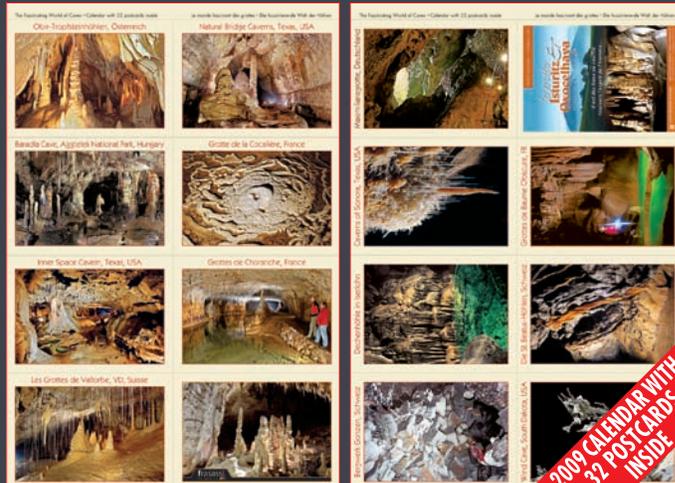


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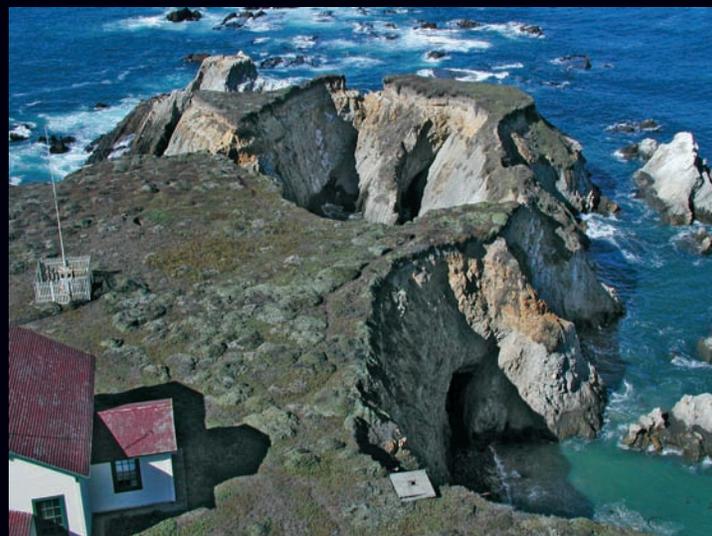
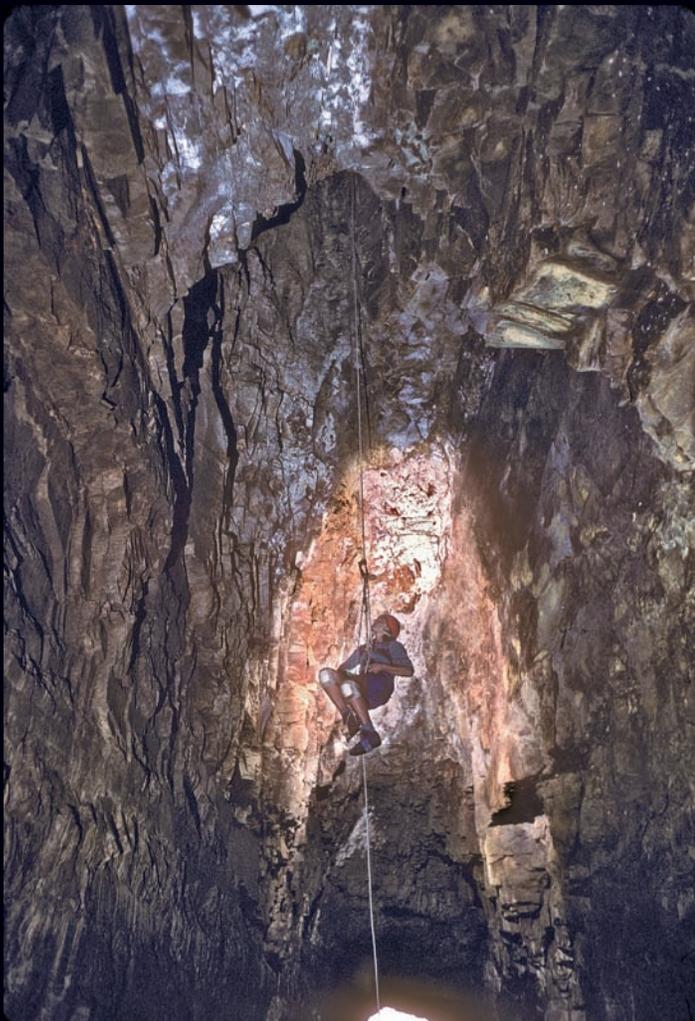
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This issue: Vertical sea caves of the world and pseudokarst of the southwest USA.