

**THE KARST AREA OF PIETRASECCA
(ABRUZZO, ITALY):
A PROJECT FOR ITS PRESERVATION AND
TOURISTIC DEVELOPMENT**

**KRAŠKO PODROČJE PIETRASECCA
(ABRUZZI, ITALIJA):
PROJEKT ZA NJEGOVO OHRANITEV IN
TURISTIČNI RAZVOJ**

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Izvleček

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Ezio Burri & Paolo Forti: Kraško področje Pietrasecca (Abruzzi, Italija): projekt za njegovo ohranitev in turistični razvoj

Kraško področje Pietrasecca je na apnenčevem hrbtu v gorah Carseolani. Med jamami sta po velikosti in obliki najpomembnejši Ovita in Grotta Grande del Cervo. Zato, da bi zavarovala to pomembno kraško okolje, ga je regionalna vlada Abruzzov razglasila za naravni rezervat. Italijanski speleološki inštitut je skupaj z oddelki nekaterih univerz v zadnjih treh letih izdelal več interdisciplinarnih študij o Pietrasecci. Najpomembnejši je morda projekt o turističnem razvoju, ki je popolnoma vsklajen s strogimi varstvenimi zakoni, kot jih ima naravni rezervat. V tem prispevku so predstavljene geografske in geomorfološke značilnosti Pietrasecce ter projekt o turizmu, v zvezi z varovanjem in ohranjanjem narave.

Ključne besede: krasoslovje, geografija krasa, geomorfologija krasa, varstvo narave, turizem na krasu.

Abstract

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Ezio Burri² & Paolo Forti³ The Karst area of Pietrasecca (Abruzzo, Italy): A project for its preservation and touristic development¹

The karst basin of Pietrasecca is located on the limestone ridge of the Carseolani mountains. Several caves are hosted in this area, the Ovito and the Grotta Grande del Cervo being the most important for size and morphology. Therefore the Abruzzi Regional Government transformed this area into a natural reserve, in order to protect its important karst environment. A multifinalized study on the Pietrasecca basin was carried out in the last three years by the Italian Institute of Speleology together with several University Departments. Perhaps the most important achieved result is a project for the touristic development, which is completely compatible with the strict preservation laws of the area, as imposed by Natural Reserve. In the present paper the geographic and geomorphological settlement of the Pietrasecca basin is briefly outlined and the touristic project is presented and discussed with regards to protection and preservation.

Key words: karstology, karst geography, karst geomorphology, nature protection, karst tourism.

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INTRODUCTION

The karst area of Pietrasecca has been known of a long time due to the presence of the Ovito sinkhole at the bottom of a large blind valley, as testified by a geographic map of the XVIII century.

But the first speleological investigations and the first partial topography of the Ovito cave were only made by the Circolo Speleologico Romano between 1925-30.

During the 1984 the Gruppo Speleologico CAI Roma dug an old landslide, thus entering for the first time into the Grotta Grande del Cervo (The Big Stag cave).

This new cavity presented a wide range of scientific interest: archaeological, paleontological, morphological and seismic being the most important ones. Therefore several studies started inside this cave: the last of which was a multifinalized study organized by the Italian Speleological Institute, co-ordinated by the Karst section of the CNR National Group "Physical Geography and Geomorphology" and researched by scientists from about 10 different Universities.

In the mean time, the inhabitants of the surroundings strongly supported the idea of transforming the Grotta Grande del Cervo into a show cave due to the quantity of beautiful speleothems and the easy internal path in the first part of the cavity. Initially the local governments promoted this idea in order to improve the presently lack of economy of the Pietrasecca thus slowing down its depopulation.

In the 1992 the Abruzzo regional government transformed all the karst area of Pietrasecca in a "Natural Reserve" (regional law n.19 , 31.03.92) in order 1- to allow the completion of the researches still developing; 2- to avoid an unbalanced touristic use, which might even destroy the relevant natural values of the area, which must be maintained.

Among the researches promoted by the regional law, one was devoted to prepare a project for the cultural and touristic use of the Pietrasecca karst, which was able to blend the preservation of the natural properties, as requested by scientists and cavers, together with the touristic and social expectations of the inhabitants.

In the present paper a short geographical, geological and geomorphological outline of the karst area is presented and then the proposed touristic project is discussed.

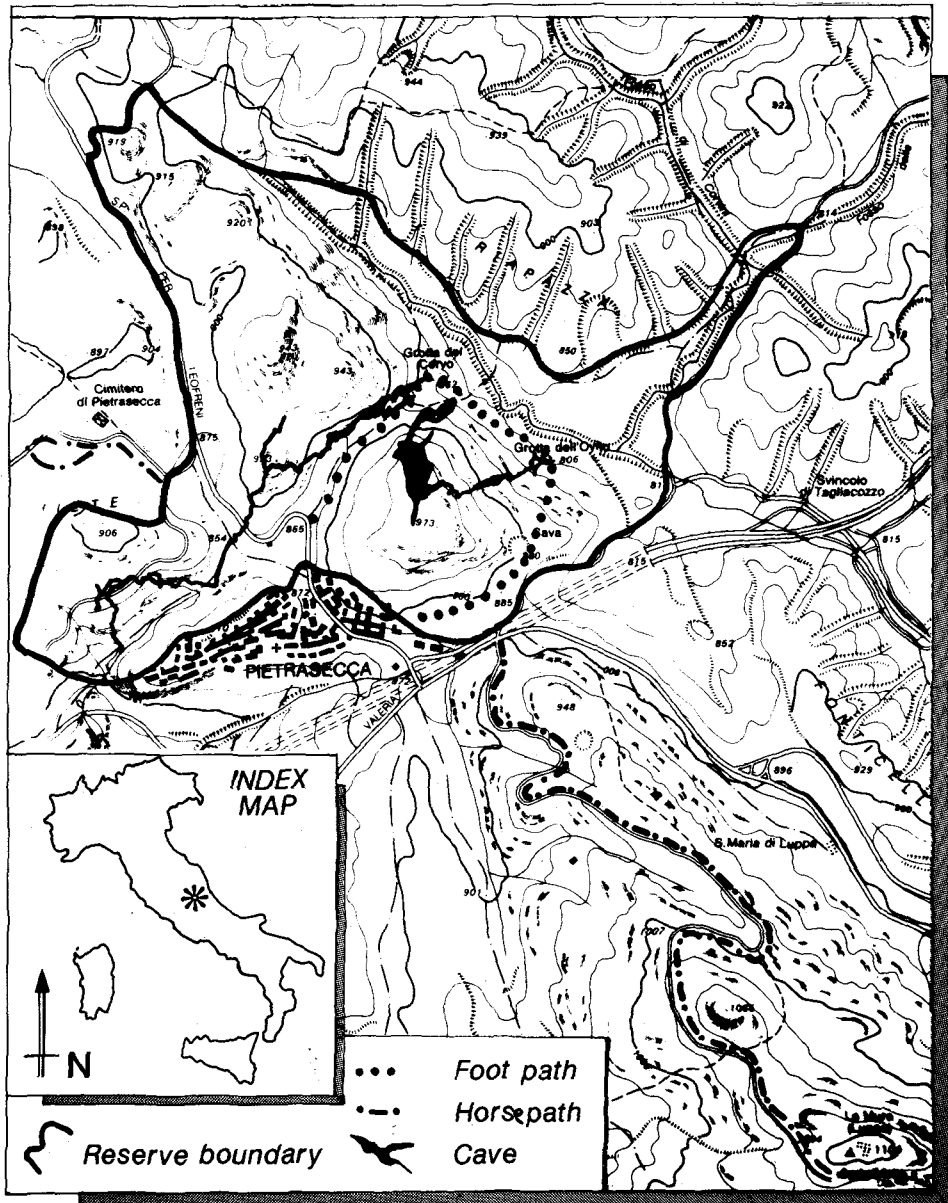


Fig. 1. Map of the Pietrasecca Natural Reserve

GEOGRAPHICAL, GEOLOGICAL, GEOMORPHOLOGICAL AND KARST SETTLEMENT OF THE AREA

The karst outcrop of Pietrasecca is located in the south-western ridge of the Carseolani Mountains (Carsoli, Abruzzo) and consists of about 9 square km just around the small village of Pietrasecca.

In its north-eastern part there is the large Ovito blind valley (13 square km), whose waters are totally drained by the sinkhole in the mouth of the cave of the same name. The risings are south-westward from the village and a small brook flows from them into the wide St. Martino valley.

The Pietrasecca karst has a temperate Mediterranean climate, characterized by hot and dry summers and cold wet winters, the mean rainfall being about 1200 mm/yr (FREDI P., PUGLIESE F., 1993).

The structural geological settlement of this area is well known (AGOSTINI, 1993): the stratigraphic sequence starts with well stratified limestones of Upper Cretaceous (about 25 m thick) over which transgressive limestones and magnesian limestones of the Middle Miocene (100-120 m thick) were deposited in conformable geometry. The deposition of calcarenites followed by marls and planctonic clays and finally by pelitic sandstones close the Pietrasecca sequence.

The object of the present paper is the portion of the ridge just where the Pietrasecca village was built: it consists of an asymmetrical anticline cut by several normal and cross faults, which caused the evolution of a subvertical slope with several escarpments.

If the structural settlement of the area was important in shaping some external morphologies, its control over the deep karst was almost complete, as the excellent fitting between structural lineations and spatial development of cave branches (CUCCHI & ULCIGRAI, 1993) testifies.

Moreover some large breakdowns and the volcanic intrusion inside the Grotta Grande del Cervo (BERTOLANI et Al., 1993) are all located just in the crosspoint of different faults, which is also the limit of some of the steps in the south-western wall of the fold.

The detailed geomorphologic analysis shown that the evolved surface forms were mainly controlled by the substratum lithology (AGNESI et al., 1993).

On the limestone ridge the structural settlement deeply influenced the landscape, which in turn was greatly modified by karst processes. Several open basins may be observed: probably they are the remains of an older karst period than the present one and their opening was induced by fluvio-karst processes.

Some small subcircular dissolution dolines and rare micro-forms, mainly karren, are also present in the studied area.

The paleo-valley crossing NE-SW the ridge is worth mentioning: it seems to be related to a paleo-drainage active in the period before the opening of

the Ovito and Grotta Grande del Cervo sinkholes.

In the Tortonian flysch the hydrographic network is well developed and channel-flow erosions are widespread: among them the small V shaped valleys and the erosional escarpments along the terraced surfaces are the most common.

The presence of several, presently inactive, forms suggest that the hydrographic network alternates static to active deepening stages.

The whole area is actually a single hydrogeological basin (BONO & CAPELLI, 1993), which is drained by the Ovito sinkhole to the Pietrasecca spring: both the two dye tracing experiments, made during a flood and in a base flow period, experienced a very high flow rate with very low dilution, thus showing the absence of storage capacity inside the limestone karst aquifer. Anyway the karst water resources may be regarded as emergency sources for drinking water supply for the Pietrasecca Village and therefore they must be adequately preserved.

But the most important scientific interest of this area is related to the deep karst (AGOSTINI & PICCINI, 1993), which is well developed. Beside some small cavities, it consists of the Ovito - Grotta Grande del Cervo-Pietrasecca rising system, which is a classical example of a hydrogeologic tunnel developed for over 3 km.

Actually the Ovito cave is an active sinkhole, while the Grotta Grande del Cervo is fossilized: the water sinks and then flows inside the first part of the Ovito, from which it is collected in the deeper part of the Grotta Grande del Cervo, then reaching the Pietrasecca rising. Anyway, in the past, both the caves were simultaneously active sinks for the waters coming from the flysch, which was in that time subdivided into two sub-basins.

The morphology of these three caves shows a noticeable structural control on the speleogenesis thus inducing a rapid evolution of the system with hydraulic gradient similar to the actual one.

Forms developed in aereate conditions dominate and testify to an enhanced erosion caused by a large stream with a high solid transport, which in turn is responsible for the widespread deposition of very thick (up to 20 m) sediments and of the complete obliteration of the Grotta Grande del Cervo, which occurred during a long period (AGOSTINI et al., 1993). All the sediments along the systems seem to be actively eroded, anyway they are still massively present in the deeper part of the system (final galleries of the Grotta Grande del Cervo).

Speleothem evolution was noticeable mainly inside the Grotta Grande del Cervo, which therefore is one of the most scenic of the whole Abruzzi. Moreover some of the speleothems are peculiar to this karst system: the permanent wind controlled coralloids of the Ovito and the interbed drainage tubes of the Grotta Grande del Cervo (FORTI, 1993).

The first part of the Grotta Grande del Cervo is characterized by a

noticeable amount of speleothem breakdowns, which developed in the last 400.000 years: thanks to a new method of analysis it was possible for the first time in the world to prove that some macroseismic periods were responsible for these breakdowns. The oldest recognized paleoseismic period occurred over 350.000 years B.P., while the youngest one was identified with the 1456 earthquake, which hit all the central and southern Italy (AGOSTINI et al., 1993).

Finally the presence of important paleontological and archaeological remains inside the first gallery of the Grotta Grande del Cervo (AGOSTINI & GIZZI, 1993) have to be mentioned.

MAN'S IMPACT OVER THE NATURAL RESERVE

The Pietrasecca village (BURRI, 1993) is still shaped on the original structure of fortified hamlet, whose features range between XV and XVIII century.

Available historical news about Pietrasecca is very scarce: in fact this village was practically isolated until present day, mainly due to the distance from the principal routes (as the "Tiburtina-Valeria" road existing from the III century B.C.).

Both existing documents on the state of the roads and touristic guides of the beginning of this century confirm that no easy connections existed with the principal regional routes, but only a small and hard mule-road. Therefore the community was more involved with the neighbouring Marsica, developing a weak economy based on non-intensive sheep and cow raising, corn, maize and potato growing, and hunting.

These activities induced an intensive utilization of the few areas suitable for agricultural use, which were obtained from the small blind valleys and dolines even removing from the surface a noticeable amount of boulders, as testified by widespread large rock piles.

The removed limestone boulders were often utilized in the construction of partition walls and terraces, the last created to lower the natural acclivity thus allowing the agricultural use of those lands. Traces of this activity, which lasted several centuries, are quite common around the village and gradually decrease getting away from it: therefore temporary dwelling places are usually absent from the territory.

The inhabitants (a few hundred people) decreased rapidly until 10 years ago due to migrations both inland and abroad. Thus most of the tilled ground was abandoned: now only few fields for fodder and some kitchen gardens close to the village are maintained.

Therefore this area suffered only a small amount of human impact, consisting of the few traditional activities in the land use.

However a noticeable degradation of the landscape was caused by the

relalization of the A24 highway, which crosses over the S.Martino Valley with a high and long viaduct just in front of Pietrasecca; as a consequence several burrows were established in the area and a limestone quarry was opened (it is presently unactive).

Pietrasecca inhabitants got no real economic advantages from the existence of this highway, whose main effect was that of lowering the availability of houses, because several of them were transformed into holiday residences for people living in Rome. At present building activities are limited to a few restorations of old houses, which in turn causes the widespread growth of small illegal waste disposals.

The caves suffered practically no impact in the past: only the Ovito sinkhole was at intervals utilized as a disposal for slaughtering refuse and a burial ground for dead animals.

Immediatly after its finding, the environment of the Grotta Grande del Cervo was sufficiently damaged: in fact cavers and other visitors brought a lot of mud into the cave, which was smeared over most of the speleothems thus causing a noticeable aesthetic loss. Moreover several cave formations were broken and, in some cases, taken out of the cave. Luckily the Grotta Grande del Cervo was gated a short time after its first exploration and the local authorities restricted the visits to the development of scientific research.

THE TOURISTIC PROJECT

The discovery of the Grotta Grande del Cervo, which hosts an important archaeologic, paleontologic and morphologic patrimony induced the inhabitants of Pietrasecca to associate the possibility of their economic revival to this cavity, thus strongly supporting the idea of transforming it in a show cave on the basis of similar experiences in some other Italian regions (Frasassi cave in Marche, Castellana cave in Apulia, and many others).

In a short time some touristic projects were presented: but the common characteristic of all of them was to suggest a traditional touristic settlement for the whole cavity, without any care for its preservation.

Two facts hindered the realization of such project: the restriction imposed on the cave by the Ministry of Cultural Patrimony due to the presence in the first gallery of peculiar archaeological remains and the beginning of some scientific research requiring an undisturbed cave environment.

Anyway, the projects were not sufficient to ensure in the near future a permanent protection to the Grotta Grande del Cervo and its natural patrimony; therefore it would be necessary to prepare a general preservation project.

The Regional Government of Abruzzo with a general law (n.61/80) on the Natural Reserves and Parks defined the Natural Integral Reserve as uncontaminated natural environment of relevant interest in which only scientific research may

be allowed. This definition fits with the "Analogous Reserve" category proposed by the UICN (Union International pour la Conservation de la Nature) and with the "Natural Monument" definition, as used in several countries (BURRI, 1989). The identification of the Ovito and the Grotta Grande del Cervo caves and their karst surroundings as "Integral Natural Reserve" is undoubtedly the best method for their safeguard.

The first problem to be solved was that of delimiting the reserve area, which must be coincident at least with the total extension of the karst basin, from the cave entrances to the risings.

A surface of about 110 hectares was defined (Fig.1), in which disposals of any kind, the use of pesticides and hunting are forbidden. Then a smaller portion of this area, practically coincident with the cave entrances, was more strictly controlled: in fact inside this any environmental perturbation is forbidden, as for collecting animals or sampling speleothems, fossil remains, etc., and access to the area is controlled.

In Italy the rules existing over a cave entrance are automatically extended to the whole cavity, therefore the restriction imposed over a very small area in reality is sufficient to preserve all the karst system.

The management of the Natural Preserve will be made in co-operation with the Italian Speleological Society, and it will practically start just after the Regional Government will promulgate the "Management plan", in which the general rules to be followed will be outlined.

The fundamental question to be solved was that of a real compatibility between the need of strict preservation and the request of some touristic development.

A further difficulty in solving this problem was represented by the existence in the same region of other caves, which were transformed in the past into show caves, whose activity may be affected if new cavities will be open to tourism.

Therefore the proposed "management plan" suggested the following program:

- On the surface:

- a) Inside the Reserve: the tracing of an educational foot-path (fig. 1) along which the main morphological and anthropic features of the area may be easily seen. Using this path-way the visitor may reach the entrances of the Ovito and Grotta Grande del Cervo, and eventually visit them.
- b) Outside the Reserve: the tracing of two horse-routes, mainly along pre-existing mule-roads, which allow a widespread view on the morphological and anthropic peculiarities not only of the Reserve but also of the neighbouring areas.

- Inside the Ovito sinkhole:

A subdivision of the cave paths into three categories characterized by an increase in safeguard and preservation (fig. 2) was made with the same method normally utilized for the Natural Reserve.

A zone: suitable for tourism. In this part a partially artificial foot-path and an emergency lightening fed by solar batteries will be realized keeping the environmental changes to a minimum.

B zone: restricted to semi-free excursion for small groups of tourists controlled by speleological guides. No fixed lights and few and simple artificial fittings to cross over the hardest pathes will be realized.

C zone: wilderness area, restricted to selected wild excursion of cavers with no environmental impact on the caves.

- Inside the Grotta Grande del Cervo:

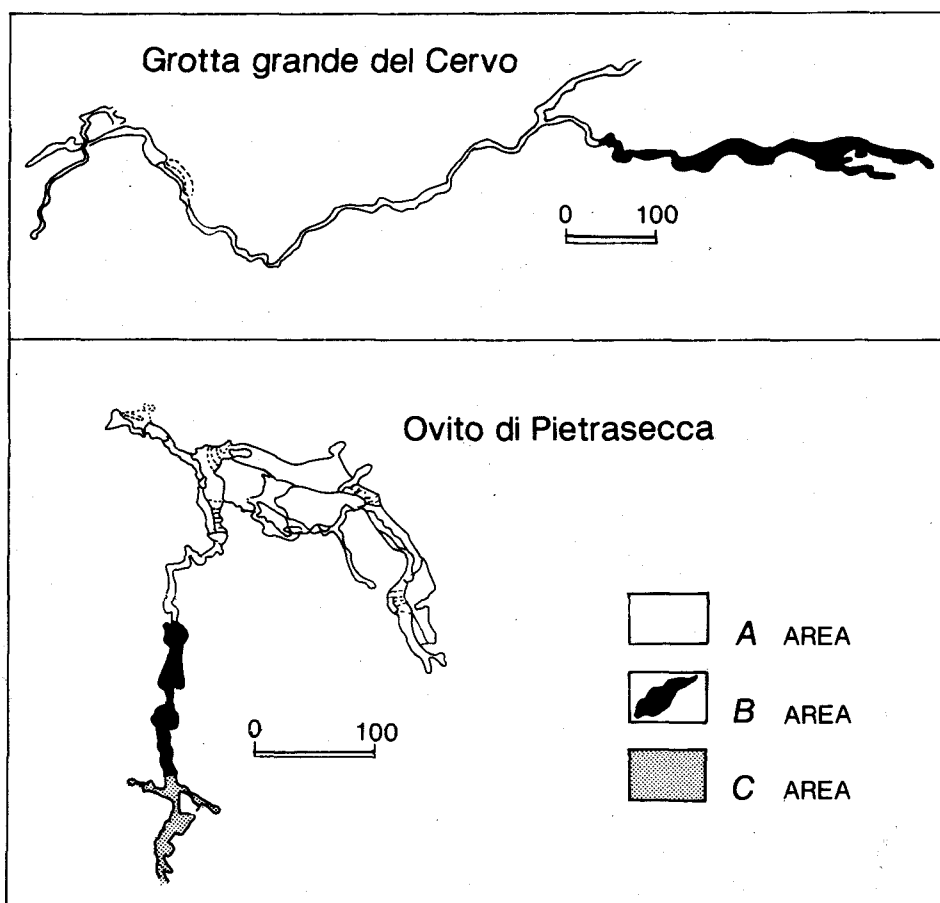


Fig. 2. Maps of the Ovito and Grotta Grande del Cervo caves in which the different areas were evidenced

This cave will not be devoted to tourism but only to educational and scientific uses: therefore no A zone has been proposed (fig. 2). Moreover monitoring of the cave parameters will be done and the allowed number of visitor/day will be determined on the basis of the achieved results (preference will be given to the students of the primary and secondary schools).

- B zone: visitors are restricted inside the signed paths, which will be partially created with artificial elements to prevent any alteration of the cave morphology; no fixed lights will be placed inside. The tours will be always led by an experienced cave guide. In all this area educational panels will be placed in all the points of interest (archaeological, morphological, mineralogical, etc.): it is worth mentioning the idea of replacing a polished vertical section of a big stalagmite, which was used for the paleoseismical study of the cave, in its original place. Finally a restoration of all the area, in which former visitors smeared mud, has been planned in order to clean the flowstones and the stalagmite crusts.
- C zone: wilderness zone: admittance to this part of the cave will be decided by a Scientific Commission and it will be allowed only for scientific research.

FINAL REMARKS

It is well known that the touristic use of a natural cavity rarely may accomplish also the preservation of its environment. This is particularly true when the cave is characterized by a low level of "energy" (as in the case of the Grotta Grande del Cervo), which correspond to a high level of vulnerability (HEATON, 1986; CIGNA & FORTI, 1989).

In the mean time it was incorrect, in our opinion, completely to refuse the request of the local community looking for the possible touristic exploitation of this karst area as the sole possibility for their social improvement.

The multifinalized studies carried out in this area created the possibility of drawing up a management plan in which both the naturalistic and the touristic requests may be contemporaneously satisfied.

Moreover in this Natural Reserve a new approach to the problem of visiting a cave was introduced and experimented for the first time in Italy: the idea is that to keep lights and fixed structures inside the cave to a minimum and therefore to transform the tourist into a caver at least partially.

We hope that this trend will be enhanced and spread in the future to the management of other natural reserves in karst areas.

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KRAŠKO PODROČJE PIETRASECCA (ABRUZZI, ITALIJA): PROJEKT ZA NJEGOVO OHRANITEV IN TURISTIČNI RAZVOJ

Povzetek

Kraško področje Pietrasecca je že dolgo znano, saj je ponorna jama Ovito označena že na zemljevidu iz 18. stol. 1984 je Gruppo Speleologico CAI Roma odkopalo vhod v Grotta Grande del Cervo, ki se je izkazala zelo pomembna za arheologijo, paleontologijo, morfologijo in seizmiko. Zato so se lotili interdisciplinarnega preučevanja, ki ga je organiziral Italijanski speleološki inštitut pod vodstvom Kraške sekcije CNR nacionalne skupine "Fizična geografija in geomorfologija" in ob sodelovanju znanstvenikov z desetih univerz. 1992 je lokalna vlada razglasila področje Pietrasecce za naravni rezervat.

Kras Pietrasecce je v jugozahodnem hrbtu gorovja Carsoli (Abruzzi) in obsega okoli 9 km² ozemlja okoli vasi Pietrasecca, na severovzhodu pa je velika slepa dolina z jamo Ovito. Ta kras grade predvsem zgornjekredni in srednjemiocenski apnenci. Jamski rovi se lepo ujemajo z geološko strukturo. Celotno področje je danes en sam hidrogeološki bazen, ki se drenira proti jami Ovito in predstavlja skupaj z Grotta Grande del Cervo in izviri pod Pietrasecco primer 3 km dolgega "hidrogeološkega tunela".

Za Grotto Grande del Cervo so značilna obsežna rušenja kapnikov pred okoli 400.000 leti. Z novo analitično metodo je bilo mogoče prvič na svetu dokazati, da so bile vzrok temu rušenju močne makroseizmične periode. Najstarejša je nastopila pred več kot 350 000 leti, najmlajša pa je identična s potresom leta 1456.

Vpliv človeka na ta kras je bil tekom zgodovine zelo majhen, saj je bila Pietrasecca majhna, izolirana vas. To se je spremenilo šele z zgraditvijo avtoceste v neposredni bližini.

V zvezi z razglasitvijo naravnega rezervata in turistično izrabo se je pojavilo dvoje temeljnih vprašanj: omejitev področja in sožitje varsta s turizmom. Določenih je bilo več con z različnimi varstvenimi režimi in različnimi možnostmi turistične izrabe.