The freshwater crayfish
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This booklet, published with funds from the Life Natura Project Requalification of the biological community in Valvestino Corno della Marogna – 2, is aimed at introducing the freshwater crayfish to visitors to the mountain territory of the upper Garda and to amateur naturalists who are interested in discovering the wealth of life hidden in the water of alpine and prealpine torrents.

The booklet offers detailed information on the distribution of the species, some historical background and biological and ecological accounts in addition to a description of the phases of the present Life Natura project.

The survival of this small crustacean depends on all of us using and managing this precious territory wisely: only this will ensure that future generations will get to know the freshwater crayfish.

And the more you get to know it, the more you respect it.

Enrico Boscaini
Ersaf Director
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Life Natura Project Requalification of the biological community in Valvestino Corno della Marogna – 2, proposed by the ERSAF, was funded by the European Commission, the Regione Lombardia and the Comunità Montana Parco Alto Garda Bresciano. The project covers the territory of the Foresta di Lombardia Gardesana Occidentale, owned by the Lombardy region and enclosed in the Parco Regionale Alto Garda Bresciano in the municipalities of Magasa, Tignale, Tremosine and Valvestino.

Project actions were decided and carried out by the ERSAF with the aim of continuing and supporting protection of the two sites of Community importance Valvestino and Corno della Marogna, in areas lying between alpine and sub-mediterranean regions and which form excellent biological corridors for all species with an extensive home range.

In order to protect and enhance the biodiversity in these places, richly expressed in a wide variety of habitats and species of flora and fauna, within a framework of sustainable development, some phases of the project saw the involvement of local farm and forest workers and schools; the aim was to sensitize the young generation in the Parco Alto Garda Bresciano to local environmental issues.

These activities form part of a more general project of development of Lombard forests set up by the ERSAF. This project is a good example of environmental management protecting and enhancing habitats within the bounds of already existing planning instruments; and of a flexible and dynamic approach which takes into account the sensibilities and interests of the local inhabitants.

Antonio Tagliaferri
project leader
Bruna Comini
project manager
NATURA 2000 AND LIFE

Natura 2000 is the name given by the European Union Council to a network of areas created for the conservation of biodiversity within the European Union. Specifically, the project was set up to protect the habitats and animal and plant species listed in Annexes I and II of the Habitats Directive 92/43/EEC; and those listed in Annex I of the Birds Directive 79/409/EEC. To help develop and implement communitary legislation and policy on environmental issues, the communitary financial programme LIFE was set up in 1992. The LIFE programme is managed directly by the European Commission as far as regulation, evaluation and approval of projects and the co-financing and monitoring of projects are concerned.

1998-2001 REQUALIFICATION OF THE BIOLOGICAL COMMUNITY IN VALVESTINO AND CORNO DELLA MAROGNA

The first LIFE project in Valvestino and Corno della Marogna, two sites of community importance (SCI IT 2070021-Valvestino and SCI IT 2070022-Corno della Marogna) was successfully completed in 2001. The aims of this project were to conserve and re-establish some important habitats that make up part of the peculiar eco-system of transition between alpine and submediterranean zones that characterizes this protected area; to favour conservation of some of the biological communities in the two SCIs; and to enhance the function of the SCIs as ecological corridors so as to improve the suitability of the ecosystem for all levels of consumers. This was done by means of interventions to improve environmental conditions. The overall thrust of these was to encourage the stable settlement or in any case presence in the SCIs of the top predators: the lynx (*Lynx lynx*); the golden eagle (*Aquila chrysaetos*); the vulture (*Gypaetus barbatus*); the Eurasian eagle owl (*Bubo bubo*); the peregrine falcon (*Falco peregrinus*); and the short-toed eagle (*Circaetus gallicus*). Ecotone surface areas between grazing areas and forests were increased by cutting back grass and bushes and carrying out margin cuts. This was done to improve local biodiversity and slow down the regrowth of forest in old grazing areas; and to improve the reproductive success of the locally threatened tetraonids and rock partridge through interventions on grassy areas. Other operations included creating new watering pools and mud baths for wild ungulates as well as specific measures to safeguard the plant that symbolizes Monte Tombea, the endemic *Saxifraga tombeanensis*. Finally, the project also involved implementing an educational programme aimed at developing knowledge of and respect for ecological issues among park inhabitants and visitors.

2004-2007 REQUALIFICATION OF THE BIOLOGICAL COMMUNITY IN VALVESTINO AND CORNO DELLA MAROGNA 2

Starting in 2004, the Ente Regionale per i Servizi all'Agricoltura e alle Foreste (ERSAF) continued and developed the measures implemented in the first project. In collaboration with local farmers and the Consorzio Forestale della Valvestino, controlled grazing was carried out with sheep and donkeys in order to maintain and restore herbaceous habitats. Silvicultural operations to improve structure were also carried out in forest habitats. In order to increase the presence of deer, amphibians and other invertebrate fauna, 10 filled-in wells were restored and 35 were given maintenance. As in the first project, action was directed at conservation of the priority species *Saxifraga tombeanensis*, achieved in some areas by experimentally removing forest cover and by eliminating competing rupicole herbaceous species. In order to halt the decline of the freshwater crayfish (*Austropotamobius pallipes*), a study of resident populations was carried out and reproduction in artificial and natural conditions in breeding facilities was conducted for later restocking in the Corno della Marogna SCI. Extensive monitoring of fauna and flora was continued in order to implement the geodatabase. Particular importance was given to contact and communication with local inhabitants: field trips and educational meetings were held with hunters, fishers and farmers; and the Parco Alto Garda Bresciano, a partner in the project, planned and coordinated an environmental education programme involving the pupils of schools within the park.
**WHO IS AUSTRONOMOBUS PALLIPES?**

_Austropotamobius pallipes_ is the complicated scientific name of the freshwater crayfish species commonly known as the white-clawed crayfish. It is one of the largest freshwater invertebrates in Italy and the only autochthonous crayfish.

**DISTRIBUTION**

_Austropotamobius pallipes_ (Lereboullet, 1858) is found in the southern part of western Europe, in Spain, France, Switzerland, Italy and the Balkan Peninsula countries with Adriatic coastlines; and on the North Atlantic side in Ireland and on the islands of the United Kingdom.

What little is known of the distribution in Italian rivers of _Austropotamobius pallipes_ goes back to the eighties and is outdated and approximate. A distribution map for the Lombardy area was drawn up in 2006 by the University of Pavia following extensive (though not yet complete) investigations.

**FRESHWATER CRAYFISH**

Kingdom: Animalia  
Phylum: Artropoda  
Class: Crustacea  
Order: Decapoda  
Family: Astacidae  
Genus: Austropotamobius  
Species: _A. pallipes_

**NAMES IN EUROPE**

Gambero di fiume (Italy)  
Cangrejo de rio (Spain)  
Écrevisse à pattes blanches (France)  
Dohlenkrebs (Switzerland)  
Rak bjelonogi, rak potocni (Slovenia e Croatia)  
White-clawed crayfish (Great Britain and Ireland)

**European distribution of Austropotamobius pallipes**

(from the Atlas of Crayfish in Europe, 2006)

- Original distribution
- Present distribution
A LITTLE HISTORY...

In the Middle Ages, the freshwater crayfish played a central role in diet and commerce. To Christians it was also a symbol of death and resurrection because of the periodic shedding and renewal of its carapace, or exoskeleton. Indeed, Crayfish were often depicted in paintings of the Last Supper produced in north-eastern alpine areas.

This biological feature also captured the interest of the alchemists, who studied transformations, and who devised an alchemical formula for the crayfish. They thus came to be considered “heretical animals” and were divested of their religious symbolism.

Nevertheless, crayfish remained the object over the centuries of intensive harvesting and commerce and were a standard item at town markets.

The thriving trade lead to the rapid spread throughout Europe of crayfish plague, an epidemic disease that originated in America, and which was first identified in 1859 in the Po Delta. The disease decimated most crayfish populations.

The already catastrophic situation was exacerbated by the impact of urban and industrial development and consequent increase in the consumption of fresh water; and by the progressive decline in the quality of water.

CRAYFISH PLAGUE

This disease, an aphanomycosis, is caused by Aphanomyces astaci, a fungus in the Saprolegniales order. Zoospores penetrate through wounds or through the softer parts of the exoskeleton, and encyst. Death is caused by the invasion of vital organs by fungal hyphae. Zoosporangia extend outside the exoskeleton of the infected crayfish and release large numbers of zoospores into the water. These can encyst and survive for one to eight weeks, depending on temperature conditions.

WHAT DOES IT LOOK LIKE?

Like all crustaceans, it has a tough, smooth external skeleton (exoskeleton) made of calcified chitin which protects it from impacts and predator attacks.

The crayfish varies in colour from greyish-green to dark brown, to camouflage it with its surroundings. Its body is divided into two easily distinguishable parts: the cephalothorax and the abdomen.

The cephalothorax, which terminates anteriorly in a triangular structure called the rostrum, bears two pairs of antennae, a complex mouth structure, a pair of chelipeds (“claws”) used in self-defence, predation and mating and four pairs of pereipods or walking legs (used to go forwards!).

IT’S PROTECTED!

The freshwater crayfish A. pallipes is classified as vulnerable in the International Union for Conservation of Nature and Natural Resources (IUCN) Red List. European Community directive 92/43, which classifies it as “a species of community interest whose conservation requires the designation of special areas of conservation” (Annex II) and as a species “whose taking in the wild and exploitation may be subject to management measures” (Annex V), was received in Italian presidential decrees DPR 357/97 and DPR 120/2003. The species was already protected in Lombardy by regional law L.R. n° 33 del 27/07/1977, which prohibited its capture, transport and sale.

Detail of a fresco of the Last Supper in the church of Santo Stefano a Rovato (BS), dating to the end of the 1400s.
The abdomen is segmented and ends in a palette-shaped tail piece called the telson, that allows the animal to swim rapidly backwards away from danger. Females fold the telson over their eggs to protect them.

Each segment of the abdomen bears a pair of appendices called pleopods (swimmerets). In the female crayfish these are all identical, whereas in the male the first two pairs, called gonopods, are modified for mating.

This makes it easy to distinguish males from females even in the youngest crayfish.

The rigid exoskeleton prevents gradual growth of the crayfish, so it must be shed and substituted periodically in a process known as ecdysis or moulting.

The crayfish emerges from its shelter in this vulnerable phase to seek an open space that will allow it more freedom of movement for the repeated contractions by which it sheds its old exoskeleton.

Once it has completed this laborious process, the crayfish has a short period in which to grow before the new exoskeleton hardens. At this point it is highly vulnerable to predation.

During moulting, any damage to the exoskeleton can be repaired and missing limbs and appendices can be regenerated. As a result of this, crayfish can have limbs and chelae of different sizes. In older animals, who moult less often, regenerated limbs remain smaller although they function normally.

Like lizards, crayfish can voluntarily self-amputate parts of their body (autotomy), such as claws that have been captured by predators or that have become trapped in crevices, in order to free themselves.

**WHAT IS ITS IDEAL HABITAT?**

The white-clawed crayfish favours clean, clear, flowing water which is cool and well-oxygenated with a bed of rock, gravel and sand. It also likes drainage ditches, torrents and water courses in hilly and prealpine areas where there are mud, silt, plant debris (leaves and branches), submerged roots and aquatic vegetation, which it uses for shelter.
It is also found in ponds, lakes and large rivers in the Po Plain, as well as in abundant resurgences and springs where the temperature is almost constant year round.

**Water:** Water must be well oxygenated (>60%) with a pH of 6 to 9 and calcium values of 50 to 100 ppm.

**Temperature:** As crayfish are heterotherms (i.e. their body temperature varies with that of the environment), water temperature is an especially important factor in their lives. Their optimal summer temperature is 15 to 18°C, with physiological distress beginning to set in at 22°C; and temperatures over 25°C being tolerated only for a short period. In winter they survive in temperatures close to 0°C.

**Altitude:** Because the presence at any altitude of the white-clawed crayfish in Italy depends partly on factors such as latitude which affect water temperature, their altitudinal range is not easy to define. The crayfish are generally found up to 800m; but can be found as high as 1200m if the temperature is high enough.

**Light:** It prefers well-shaded water courses with abundant riparian vegetation that prevents direct sunlight falling on the water surface. Indeed, the crayfish's activity is mainly crepuscular and nocturnal, consistent with the passage from mosaic vision (like that of insects) to continuous vision (like that of man).

**WHAT DOES IT EAT?**

_A. pallipes' diet varies according to the type of water course it lives in and includes live prey selected among aquatic invertebrates (insect, crustacean and mollusc larvae, etc.), plant matter (algae and macrophytes) and fruit and seed debris. It is however, predominantly animal: small insects, and the carcasses of fish and other animals. Food is grasped with the chelae and brought to the mouthparts, densely lined with tactile and olfactory setae, where food is selected and then ground in the mandibles.*

**HOW DOES THE CRAYFISH REPRODUCE?**

White-clawed crayfish reach sexual maturity in their third or fourth summer, when males have grown to 60-70 mm and females to 55-60 mm. Coupling takes place in Autumn, in October and November, generally when water temperature is around 10 °C.

After a sort of courtship, the male turns the female on her back and deposits spermatophores under her abdomen. About a week later, eggs are excreted from her genital pores (small orifices on the female cephalothorax at the level of the third pair of walking legs) and fertilized by the spermatophores.

The eggs (about 50 – 100) are held under the abdomen, attached to the pleopods throughout the winter and until the end of Spring. The female stays inside her shelter for most of this time, cleaning debris away from the eggs and keeping them well oxygenated.
The eggs hatch after four to seven months, depending on temperature conditions in the water course.

The newly hatched larvae are less than a centimetre long, although their appearance is similar to that of adults. Their first year of life is the riskiest, with the highest mortality rate.

**THE FIRST DAYS OF LIFE...**

Hatchlings have a large cephalothorax which accommodates food reserves for the first three or four days of life, when they cling with miniscule claws to their mother’s abdomen. The first moult occurs after about the first week of life, and the young become independent, feeding themselves and moving about freely, although they do not go far from the mother who calls them back by means of alarm pheromones in case of danger.
TIME TO GROW!

Moulting, which allows the body to grow, takes place at varying intervals, occurring more often in juveniles than in adults. It is limited to the summer, in concurrence with favourable temperature and local environmental conditions. White-clawed crayfish can reach lengths of over 120 mm, and weights of 70-80g, although females are always smaller than their male counterparts.

ENEMIES

Diseases:
Crayfish plague, mentioned above, is the most serious disease, and can kill off entire populations.

Another mycosis, Burn Spot Disease caused by Fusarium, causes gill and muscle lesions. Externally, the disease presents as black-red spots, which give the disease its name; and which can degenerate into open lacerations. The disease has a long course and fairly low mortality rate. Deaths are often due to secondary bacterial infections.

The endoparasitic microsporidian *Thelohania contejeani* causes Porcelain Disease, which results in degeneration of the muscle tissues. The disease usually spreads through cannibalism and necrophagia of infected crayfish. It is easily diagnosed because the ventral part of the abdomen turns a porcelain white colour. The disease may take several months to run its course. Other pathologies, like that caused by the *Anellidi irudinei* of the Branchiobdella genus, weaken crayfish, making them more vulnerable to epidemics.

Allocthonous crayfish: The most serious threat to our crayfish comes from introduced exotic species - *Procambarus clarkii* and *Orconectes*

THE KILLER CRAYFISHES

Two exotic species account for the most serious threat to the survival of the Italian freshwater crayfish *Procambarus clarkii* and *Orconectes limosus*.

The Louisiana crayfish, *Procambarus clarkii* (Girard, 1852), native to the central and southern states of North America, is the most widespread allochthonous species in Italy, where it has naturalized in northern and central areas. It is a fast-growing, highly fertile species. Crayfish become sexually mature only a few months after birth. An adult female can produce up to 600 eggs and may do so two times in one year. Embryos take 2-3 weeks to develop at 22°C. This species favours warm water and can survive at temperatures of over 40°C, but can also adapt to low winter temperatures by sheltering in deep holes (40-90 cm) which it digs on the bottom or in the banks of the water course. It can adapt to widely varying environments and live in oxygen-poor conditions by breathing with its gills out of the water. This ability allows it to move from one water course to another. Because it is a healthy carrier of crayfish plague, it is the main vehicle for the spread of this disease.
limosus – which are progressively replacing autochthonous populations and which endanger their very survival. These two American species, in most cases voluntarily or involuntarily introduced, bring with them life-threatening pathogens like crayfish plague. They are more competitive than *Austropotamobius pallipes*, and have far more effective behavioural and reproductive strategies.

Another allochthonous species of European origin is the Turkish crayfish *Astacus leptodactylus*. It is not yet common in nature, although it is widely bred for the food market.

**Poaching:** Despite being protected by European, national and regional laws, frequent illegal fishing of the white-clawed crayfish is a threat to the survival of all populations. It is especially damaging to already vulnerable populations, and when juveniles and berried females are caught.

**Drought:** Small, unpolluted hillside water courses, which provide the ideal habitat for these crayfish, are often particularly vulnerable to drying up especially in summer, because of their limited capacity. The persistence and spatial continuity of surface water courses is obviously a critical factor in the conservation of *Austropotamobius pallipes*.

**Pollution:** Our crayfish is particularly sensitive to heavy metals and pollutants in the runoff containing herbicides, pesticides and synthetic fertilizers used in agriculture. The organic pollution from human settlements and animal breeding activities not only weakens the crayfish, making it more vulnerable to diseases, but also seriously damages its habitat by reducing the amount of oxygen in the water and altering the macroinvertebrate communities found in torrents.

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*Orconectes limosus*

(Rafinesque, 1817), commonly called the Spinycheek crayfish, is native to the East Coast of the United States. It was introduced into Europe in the second half of the 1800s and spread throughout most of the continent and is now present in many regions of Italy. It is an extremely active and aggressive species which when captured assumes a characteristic posture with its abdomen folded over and its claws extended to touch the tip of the telson. Less choosy than other species about water quality, this crayfish can colonize medium-slow flowing water courses, and lakes and ponds even where water is very polluted. Its favourite habitat is, however, water courses with a muddy or sandy substrate in which it can dig shelters. It is a healthy carrier of crayfish plague.

Kingdom: *Animalia*
Phylum: *Arthropoda*
Class: *Crustacea*
Order: *Decapoda*
Family: *Cambaridae*
Genus: *Orconectes*
Species: *O. limosus*

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**SOME GOOD ADVICE**

An important aspect of crayfish management is the need to monitor the extraction and diversion of water for irrigation and hydroelectrical production. Large reductions in the quantity of water lead to strong increases in summer temperatures and enhance the effects of pollution, which is less diluted. This can lead to stress and susceptibility to pathologies, often epidemic. Poor administration of water resources resulting in the drying up or contamination of a great number of water courses, has lead to the extinction of numerous crayfish populations.
Channel modification: alteration of the morphology of water courses is especially damaging to *Austropotamobius pallipes* populations: channel deepening, excavations, rectifications – and the denaturalization of the bank through the construction of bank protection and dams. In addition to a direct, mechanical impact, these operations cause considerable changes in section, depth, current speed and the river bed sediment composition. These, in turn, cause a drastic reduction in environmental diversity and simplification of the water course and disappearance of some or all of the shelters that are indispensable to the crayfish.

Visibly polluted water course

Transverse barrier in a water course reducing the flow downstream

Extreme rectification of river banks in a water course in the Po Plain

**IDENTIFICATION OF THE FRESHWATER CRAYFISH FOUND IN ITALY**
Adapted from Arrignon, 1996 and Delmastro, 1999

**Italian crayfish, Austropotamobius pallipes**

**Turkish crayfish, Astacus leptodactylus**

**Spinycheek crayfish, Orconectes limosus**

**Louisiana crayfish, Procambarus clarkii**
THE LIFE PROJECT

In order to prevent the extinction of the white-clawed crayfish in the Valvestino and Corno della Marogna special areas of conservation, an initial feasibility study on *Austropotamobius pallipes* repopulation was conducted. The hydrography of the two areas was then studied, and the crayfish populations surveyed and censused. Repopulation was then carried out in a series of planned phases, in accordance with recommendations from the feasibility study.

THE PHASES

The distribution and density of crayfish populations in the special areas of conservation were established over the course of 2004. The survey was then extended to the territory surrounding these areas.

IDENTITY CARD

Doubts about its taxonomic position remain. Genetic studies show that Italian populations of the freshwater crayfish genus *Austropotamobius* belong to two different species: *A. pallipes* in the north west and *A. italicus* in the rest of continental and peninsular Italy, with a zone of syntopy in the Apennines of Piedmont and Liguria. The species found in the protected area (Parco Alto Garda Bresciano) where this project was carried out is *A. italicus*. European legislation only protects *A. pallipes*, which in reality corresponds to a complex of species, all of which are seriously threatened. This misunderstanding is at the root of legislative weaknesses which need to be remedied.

As no morphological differences have been identified, genetic analyses are required to distinguish these two species. This complicates the management of breeding and reintroduction programmes. The situation becomes even more complex if the haplotypic differences between populations of the same species living in different water catchment areas are taken into consideration.

An investigation of all the water courses detected only one population in Valvestino, although the quality of the water itself is excellent in terms of both biological and biochemical traits. That this is probably due to the high elevation and consequent low water temperature in these special areas of conservation is strongly suggested by the fact that there are several crayfish populations in water courses at lower elevations in adjoining territory outside the limits of the conservation areas.

This single population was quantitively monitored for the entire duration of the project.

**Genetic analyses** were carried out on the crayfish populations inside and in the water courses adjacent to the areas of conservation. All populations were attributed to the species *A. italicus*; and two haplotypes, already known of in other torrents in Italy, were identified.

**An environmental survey** was carried out to determine the presence and persistence of factors that have caused the fall in crayfish numbers. Specifically, environmental factors critical to the survival of the crayfish were evaluated in order to identify the best locations for recolonization and for reproduction in the wild in the two conservation areas.

The chemical and physical parameters and biological quality of the water along with the composition of torrent beds, river bank morphology and the features of the surrounding environment were surveyed.
The main members of the zoocenosis in the aquatic habitats were also censused; and evaluations carried out of the status of fish populations and of human activities around the areas selected for crayfish repopulation.

With the resulting data in hand, it was possible to select water courses that would be suitable for repopulation and those in which to attempt reproduction in the most natural conditions.

It was decided to carry out reintroduction in the Corno della Marogna site of community importance, where no crayfish were found in the census. Reproduction in the wild already occurs in the Valvestino special area of conservation. A crayfish breeding facility was set up in the disused ERSAF forest nursery at Prabione. An artificial pond was designed and built here during the project.

THE BREEDING FACILITY...

.....in the 10 tanks

Ten tanks were set up, through which water from the Rio Acquasignega and an adjacent spring is fed continuously. Each tank (70x50 cm, with a depth of 50 cm) was equipped with a perforated brick to act as a shelter for the crayfish.

About a hundred crayfish overall (ca 60 females and 30 males) can be housed in the tanks. PH, conductivity and dissolved oxygen are periodically checked. Water temperature is automatically recorded every two hours. It has been possible to observe all phases of reproduction in great detail in the breeding facility.

....in the artificial pond

To avoid the effects of excessive captivity during the reproductive period, an external pond (12x3 m, with a depth of 40 to 60 cm) was built to simulate a real pond. It was made more natural by adding bundles of twigs, stones, macroinvertebrates and leaves. About twenty perforated bricks were placed on the bottom to act as shelters. The crayfish introduced (about 150 females and 50 males) complete the entire reproductive cycle in a more natural setting.

The pond is fed with water from the same sources as the tanks.

REPRODUCTION IN NATURE

A water course in the Valvestino special area of conservation was chosen, partly for its suitable environmental characteristics but primarily because of ease of inspection, due to a small cement weir which would also prevent dispersion of the crayfish downstream. Some tens of reproductive crayfish were introduced for two consecutive years. Periodic monitoring of their adaptation and phase of development yielded positive results.

REPOPULATION

Crayfish born in captivity were also released in a small torrent in the Corno della Marogna special area of conservation identified as suitable in the pheasibility study. This was the only water course whose temperature conditions were found to be suitable after over a year of automatic recording. Temperature values for this water course were similar to those in the Valvestino torrent where crayfish were released.
Reproductive crayfish from genetically suitable populations were captured from torrents in September. They were then individually marked and placed in the breeding facility to mate and reproduce.

The juvenile crayfish were then used at the end of the following summer to repopulate torrents identified as being suitable in the pheasibility study.

An important part of the project consisted of involving local inhabitants in public meetings with fishermen’s associations; and environmental awareness lessons in the park schools. Panels illustrating the crayfish lifecycle were also produced.

NETWORKING WITH OTHER LIFE NATURA PROJECTS

The present Life project was coordinated with and exchanged technical and scientific information with two other projects co-financed by the Life Natura project: Life Natura Project 03 NAT/IT/000137 Austropotamobius pallipes*: protection and management in central Italian special areas of conservation; and Life Natura Project 00 NAT/IT/7159 Conservation of Austropotamobius pallipes in two special areas of conservation in Lombardy, which saw experiences, difficulties and results being shared. One outcome of this exchange was the confirmation that crayfish management is a delicate task and that breeding and reproduction techniques require further refinement and must be adapted to suit specific situations.

OTHER LIFE PROJECTS...

“AUSTROPOTAMOBIIUS PALLIPES: PROTECTION AND MANAGEMENT IN CENTRAL ITALIAN SPECIAL AREAS OF CONSERVATION”
LIFE03 NAT/IT/000137

The protection and management plan for A. pallipes was preceded by a general study and ascertainment of the species in the water basins encompassed in the sites of community importance in central Italy. New information on past and present crayfish populations in the area was gathered and many of the data reported in the literature or by local experts and amateurs were confirmed in the field.

This phase was followed by the construction of breeding facilities to raise juvenile crayfish to release in the wild. The breeding tanks were set up in pre-existing specialized structures: the Valle di Borrello (CH) incubating facility in the Cascate del Verde regional nature reserve; and the CISI fish breeding facility at Vetoio in Provincia dell’Aquila.

Juveniles were bred from reproductive crayfish captured in rivers and water courses within the two provinces.

The juveniles were released in those water courses which had been identified in previous studies as being fit for crayfish life; and a system of surveillance by local authorities and associations was activated.

“CONSERVATION OF AUSTROPOTAMOBIIUS PALLIPES IN TWO SPECIAL AREAS OF CONSERVATION IN LOMBARDY”
LIFE00 NAT/IT/007159
The objective of the project was the conservation of *A. pallipes* through the reestablishment of natural populations in the Valle del Rio Pegorino (situated in the Parco Valle Lambro) special conservation area and in some irrigation ditches and canals in the Basso Corso and Sponde del Ticino special areas of conservation.

A particularly important aspect of this project was the construction of a semi-natural crayfish breeding facility consisting of a large tank (300 x 15 m) fed by spring water in the Riserva Isola del Mandelli near Vigevanlo in the Parco del Ticino. The project involved the release of a sufficient number of crayfish in pre-selected water courses characterized by plentiful shelters and high quality water. To evaluate the success of repopulation, new populations were constantly monitored. Repopulation and population monitoring were carried out by the Animal Biology Department of the University of Pavia, while the General Veterinary Pathology Institute of the University of Milan tracked the health of the animals; and the Department of Structural and Functional Biology of the University of Insubria carried out genetic analyses on the starter and new descendent populations.

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