Title: ANCHORAGE STRUCTURE FOR VEGETABLE ORGANISMS

Abstract: The invention concerns an anchorage and growth support structure for vegetable organisms to anchor to underwater bottoms (10), which comprises a framework (1, 1', 4, 4', 5, 5') to which one or more metallic nets (2, 2U, 2L), and one or more substrates (6), capable of containing one or more cuttings of at least one vegetable organism, are coupled, said one or more metallic nets (2, 2U, 2L) being capable to make said one or more substrates (6) come into contact with the bottom (10) when the framework is deposited on the same bottom (10), the framework (1, 1', 4, 4', 5, 5') said one or more metallic nets (2, 2U, 2L), and said one or more substrates (6) being made of respective biodegradable materials.
ANCHORAGE STRUCTURE FOR VEGETABLE ORGANISMS

The present invention relates to an anchorage and support structure for growing vegetable organisms that allows, in a simple, reliable, efficient, and inexpensive way, to stabilise vegetable organisms on sea-bottoms, in particular cuttings of marine phanerogams, protecting the same from the sea-bottom currents and fostering a fast taking root.

In the following of the description specific reference will be made to stolon marine phanerogams, in particular Posidonia oceanica, as vegetable organisms, but it should be understood that the anchorage structure according to the invention may be used for any vegetable organism living in water, for instance in marine, lake, or river environment.

It is known that, among the four spontaneous phanerogams colonising the sandy and muddy loose sea-bottoms of the Mediterranean Sea, i.e. Posidonia oceanica, Cymodocea nodosa, Zostera noltii and Zostera marina, mainly the Posidonia and, even if to a lesser extent, the Cymodocea are the most frequent ones. Phanerogams are superior plants provided with rhizome, leaves, flowers and fruits. Leaves are band shaped, larger in Posidonia, which gives a characteristic aspect to the underwater seagrasses which such plants form in the shallow water close to the coast, down to 40-50 metres of depth. Such seagrasses are mostly on movable (muddy and sandy) bottoms, more rarely on stable, rocky ones, where their rhizomes form a dense plaiting (or matte) on the bottoms.

In particular, the Posidonia oceanica, but even the other phanerogams of Mediterranean, is nowadays protected and considered as a qualifying element of the environment health state and water quality, also recognised by European Commission Directive 92/43. In fact, the phanerogam seagrasses are of fundamental importance for the marine ecosystem, both with regard to oxygen and organic substances production, and as life environment for innumerable marine organisms, also important from the naturalistic point of view such as the Miniacina miniacea and the Mihapoda truncata, considering the huge space that such seagrasses put at their disposal: the actual surface of the leaves in 1 m² of seagrass is about 20 to 50 m². Phanerogam seagrasses are hence a very important ecosystem, further contributing to the biodiversity of the underwater world and to the preservation of its biological processes.

Moreover, along sandy coasts, the Posidonia and Cymodocea
seagrasses have an important anti-erosive role, since their complex rhizome apparatus exerts an action of fastening the bottoms and, along with that of leaves, it contributes to the hydrodynamic damping of the wave motion and of the bottom currents.

Phanerogams are extremely sensitive to deterioration of the environment. In particular, presently in the Mediterranean basin there is a progressive reduction of such seagrasses mainly due to the detrimental effects of trawling and frequent anchorages, to which those of increasing pollution add, which are likely to cause seriously harmful effects for the equilibrium of the whole marine ecosystem.

Consequently, the need presently exists of reconstituting seagrasses of marine phanerogams, and of other stolon species, damaged by anthropogenic activities, pollution and/or natural events, bringing the marine ecosystem under intervention back to equilibrium.

Some techniques of phanerogam implant have been developed, which use metallic nets, usually having large meshes, deposited on the sea-bottom, to which cuttings of phanerogams are fastened.

However, such conventional implant structures suffer from some drawbacks.

First of all, the metallic nets are used in "large scale" interventions and not on localised and confined areas. In fact, the nets often cover surfaces larger than necessary, depositing the wide meshes on the remaining structures of the existing posidonia beds, when intervention is at the border of pre-existing seagrasses, irremediably damaging them.

Moreover, the used nets entail a strong anthropogenic impact on the marine environment, mainly due to biological stress and bottom degeneration. In fact, net meshes, which are not adjustable and of excessive diameter, cannot be fastened to the bottom. This entails that the weak flow of bottom currents creates movements of the same meshes causing the original "matte" or the young one under formation to be undermined. Still, such metallic nets are not biodegradable, and during their deterioration they release polluting substances in the environment causing an excessive bio-accumulation in the same contacting seagrass.

Furthermore, the used metallic nets entail a poor taking root of phanerogams. In fact, even in the case of smaller metallic nets, the
cuttings are fastened through simple wires, which most times block the cuttings in a too much tight way, causing damages to the rhizome vitality, or which are not sufficiently tied, causing the loss of the cuttings. In particular, the cuttings are horizontally fastened on the metallic net, without a direct contact with the sandy substrate, causing a high mortality, worsened by the fact that typically used cuttings are obtained in laboratory, and hence they are incapable to "bear" the stress of planting in open environment.

Finally, present implant techniques entail higher costs in terms of labour and maintenance, making the coverage of vast coast areas particularly burdensome.

It is therefore an object of the present invention to allow in a simple, reliable, efficient, and inexpensive way, to stabilise vegetable organisms on sea-bottoms, in particular cuttings of marine phanerogams, protecting the same from the sea-bottom currents and fostering a fast taking root.

It is therefore specific subject matter of the present invention a structure for anchoring vegetable organisms to underwater bottoms, characterised in that it comprises a framework, to which one or more metallic nets, and one or more substrates, capable to contain one or more cuttings of at least one vegetable organism, are coupled, said one or more metallic nets being capable to make said one or more substrates come into contact with the bottom when the framework is deposited on the same bottom, the framework, said one or more metallic nets, and said one or more substrates being made of respective biodegradable materials.

Always according to the invention, the framework may be made of lean cement, preferably obtained with a special mixture of fine paste river conglomerate.

Still according to the invention, said one or more metallic nets may be made of non zinc plated iron.

Furthermore according to the invention, said one or more substrates may be malleable and substantially composed of coarse grain inert polymers, preferably wet with biostimulators, more preferably auxins based biostimulators.

Always according to the invention, the framework substantially may define a frame, preferably but not necessarily having a square shape.

Still according to the invention, the framework may comprise a
sole element, or it may comprise two or more elements coupled to each other through connecting mechanical means capable to allow said two or more elements to be reciprocally adjustably positioned when the framework is deposited on the bottom.

Always according to the invention, said connecting mechanical means may comprise one or more hooks, partially incorporated into the framework.

Furthermore according to the invention, said connecting mechanical means may be made of biodegradable material, preferably non zinc plated iron.

Always according to the invention, said one or more substrates may be, preferably removably, fixed to the framework.

Still according to the invention, said one or more substrates may be fixed to the framework through one or more connecting small blocks.

Furthermore according to the invention, at least one of said one or more metallic nets may be partially incorporated into the framework.

Always according to the invention, said at least one metallic net may be coupled to a reinforcement, preferably made of non zinc plated iron, buried in the framework.

Still according to the invention, at least one of said one or more metallic nets may be removably coupled to the framework, so as to be temporarily removable from the same framework.

Furthermore according to the invention, at least one of said one or more substrates may be housed between two of said one or more metallic nets.

Always according to the invention, the structure may further comprise mechanical means for fixing the framework to the bottom.

Still according to the invention, said fixing mechanical means may comprise one or more supports substantially having an U-like shape.

Always according to the invention, said fixing mechanical means may be made of biodegradable material, preferably non zinc plated iron.

Furthermore according to the invention, the structure may further comprise detector means, preferably means for detecting one or more pollutants, more preferably biological and/or instrumental sensors.

Always according to the invention, the structure may further
comprise at least one protection cage, preferably made of biodegradable material, more preferably of non zinc plated iron, capable to surround said one or more substrates.

Still according to the invention, the framework may further comprise coupling mechanical means, capable to interact with corresponding coupling means of an external structure.

Always according to the invention, said coupling mechanical means may comprise one or more hooks, partially incorporated into the framework.

Furthermore according to the invention, said coupling mechanical means may be made of biodegradable material, preferably non zinc plated iron.

Always according to the invention, said external structure may be an anchorage structure as previously described.

The present invention will now be described, by way of illustration and not by way of limitation, according to its preferred embodiments, by particularly referring to the Figures of the enclosed drawings, in which:

Figures 1a, 1b, and 1c show a perspective view, a top plan view, and a sectional view according to line A-A of Figure 1b, respectively, of a first embodiment of the anchorage structure according to the invention;

Figures 2a, 2b, and 2c show a perspective view, a top plan view, and a sectional view according to line B-B of Figure 2b, respectively, of a second embodiment of the anchorage structure according to the invention;

Figures 3a, 3b, and 3c show a perspective view, a top plan view, and a sectional view according to line C-C of Figure 3b, respectively, of a third embodiment of the anchorage structure according to the invention;

Figures 4a, 4b, and 4c show a top plan view, a sectional view according to line D-D of Figure 4a, and a perspective view of the section of Figure 4b, respectively, of a fourth embodiment of the anchorage structure according to the invention;

Figures 5a, 5b, and 5c show a top plan view, a sectional view according to line E-E of Figure 5a, and a perspective view of the section of Figure 5b, respectively, of a fifth embodiment of the anchorage structure
according to the invention;

Figures 6a, 6b, and 6c show a top plan view, a sectional view according to line F-F of Figure 6a, and a perspective view of the section of Figure 6b, respectively, of a sixth embodiment of the anchorage structure according to the invention;

Figures 7a and 7b show a top plan view and a sectional view according to line G-G of Figure 7a, respectively, of an application example of the anchorage structure of Figures 1a-1c;

Figures 8a and 8b show a top plan view and a sectional view according to line H-H of Figure 8a, respectively, of an application example of the anchorage structure of Figures 2a-2c; and

Figures 9a and 9b show a top plan view and a sectional view according to line J-J of Figure 9a, respectively, of an application example of the anchorage structure of Figures 3a-3c.

In the following of the description same reference numbers will be used for indicating alike elements in the Figures.

With reference to Figure 1, it may be observed that a first embodiment of the anchorage structure according to the invention comprises a frame 1 of lean cement, equipped with an iron net 2 having a mesh with width adjusted depending on the size of the root apparatus of the cutting to place. The frame, that in Figure 1 has a square shape, may be differently shaped. Even the size of the frames may vary, being preferably equal, for the use for cuttings of Posidonia oceanica, to about 50cm x 50cm of side, with internal side 40cm x 40cm, with a useful span of 1600 cm².

In particular, the cement of the frame 1 is obtained with a special mixture of fine paste river conglomerate, that makes supports biodegradable during five years. The iron used for the net 2 is not zinc plated and is, therefore, easily oxidisable and, consequently, biodegradable still in the space of five years. Oxidisation produces a nutritional substrate for the phanerogams to implant, usually suffering from lack of iron.

The anchorage structures still comprise one or more specific substrates, not shown in Figure 1, preferably easily malleable, hydrophilic at different qualities of absorption and mixture chemical composition, mainly composed of coarse grain inert polymers and wet with auxins based biostimulators; such composition does not allow the substrate to
quickly crumble and degrade in underwater environment, and it holds rhizomes more easily, which are grafted as it will be explained in detail below, favouring their germination. In particular, the growth substrate may have several shapes depending on the needs: parallelepipeds of various thicknesses, rim, sphere, cylinder, cone, heart shape, star shape. The substrate is also made in material wholly biodegradable in the space of five years and it has null anthropogenic impact grade.

For installing the structure of Figure 1, the substrates are deposited on the matte and, on them, the structure of Figure 1 so that the frame 1 beds in the bottom by some centimetres and each single substrate is firmly fixed to the same bottom being in close contact with the metallic net 2. Preferably, the portion of substrate to place within the structure must be lower than the upper edges 3 of the same frame 2 by some centimetres. The size of the substrates may be varied on the basis of the type of desired composition; preferably, the substrates do not touch the walls of the frame 2 of the structure but with the corners, so as to make room for the rhizomes which are made and for the future composition of the "matte". If necessary, the substrates may be fixed to the frame 2, preferably to its side walls, through one or more connecting small blocks, so as to remain further blocked.

After the installation of the anchorage structure on the sea-bottom, bedding out the cuttings is manually made by scuba diver technicians who insert the cuttings into the substrates, preferably for at least 2/3 of their rhizome length, so that the rhizome and the roots are in contact with the sediment. Preferably, the cuttings used for the interventions directly come from their natural environment, and due to this they do not have high problems of taking root in relation to the stresses linked to planting in the area of intervention.

A plurality of anchorage structures is advantageously positioned on the bottoms so as to form a uniform net. The system for anchoring the structures to each other and to the bottoms may vary depending on the specific marine environment and the size of the areas to re-grass.

By way of example, Figure 2 shows a second embodiment of the anchorage structure according to the invention, similar to that of Figure 1, further provided with iron coupling elements 4 directly inserted into the frames 1, having a substantially hook-like shape, capable to interact with similar elements 4 of an adjacent structure so as to fix to each other the
contiguous sides of the respective frames 1. Even the iron used for the
coupling elements 4 is not zinc plated and is easily oxidisable and, 
therefore, biodegradable.

With reference to Figure 3, it may be observed a third 
embodiment of the anchorage structure according to the invention that 
differs from that of Figure 1 in that the frame is not made of a sole piece, 
but it is subdivided into two halves 1 and 1', coupled to each other by 
respective coupling elements 5 and 5', preferably still having a 
substantially hook-like shape, capable to interact with each other. The 
structure of Figure 3 is advantageous in case of rough bottom since, being 
substantially adjustable in correspondence with the connection through the 
elements 5 and 5', it adapts to the same bottom and to the bottom 
currents.

Other embodiments of the anchorage structures according to 
the invention may comprise, instead of only one net 2, two metallic nets, 
between which the substrates for housing the cuttings are arranged.

Figures 4, 5, and 6 show, respectively, a fourth, a fifth, and a 
sixth embodiment of the anchorage structure according to the invention, 
similar to those shown, respectively, in Figures 1, 2 and 3, wherein the 
sole metallic net is replaced with a pair of metallic nets, respectively an 
upper one 2U and a lower one 2L, both hooked to a linear reinforcement 2' 
buried in the frame 1 of the respective structure. Two substrates 6 are 
shown between the two nets 2U and 2L. Preferably, the substrates 6 are 
slightly higher with respect to the frame base 7.

The installation of the structures of Figures 4-6 is carried out as 
in case of the structures of Figures 1-3, taking care that the frame 1 beds 
in the bottom by some centimetres down to the substrates 6 touch the 
bottom, so as to favour the following taking root of the rhizomes.

Other embodiments of the anchorage structures according to 
the invention may provide that at least one of the two nets is removably 
coupled to the frame (for instance through coupling means, such as hooks 
or the like), so as to allow it to be temporarily removed and to allow access 
to the internal space delimited by the two nets, for instance for placing the 
substrates there.

As said, the anchorage structures according to the invention are 
preferably placed on the bottoms so as to form a uniform net comprising a 
plurality of structures. In particular, the system for fixing the structures to
the bottoms may comprise iron supports (still not zinc plated so as to easily oxidise and to be biodegradable).

By way of example, Figure 7 shows the use of supports 8 for fixing a plurality of structures to the bottom which are arranged according to a row as shown in Figure 1. Such supports 8 have a substantially U-like shape that, through the insertion of the U arms 9 (of proper length depending on the bottom) into the bottom 10, fix together the contiguous sides of the frames 1 of adjacent structures.

Similarly, Figure 8 shows the use of similar supports 8' for fixing a plurality of structures to the bottom which are arranged according to a row as shown in Figure 2, coupled to each other through the interaction of the elements 4. Such supports 8' have a substantially U-like shape narrower than that of supports 8 of Figure 7, for fixing the side of a single frame 1 to the bottom 10 through the insertion of the U arms 9'. Obviously, in case of an array arrangement of the plurality of structures having a plurality of rows or in case of a staggered arrangement, supports 8 as those of Figure 7 may be used for fixing contiguous sides of two frames 1 of structures belonging to adjacent rows to the bottom 10.

Still, Figure 9 shows the use of supports 8, as those of Figure 7, for fixing a plurality of structures to the bottom which are arranged according to a row as shown in Figure 3, wherein the two halves 1 and V of each structure are coupled to each other by the respective connecting elements 5 and 5'.

Further embodiments of the anchorage structure according to the invention may provide the use of different types of substrates, made, for instance, of polymers capable to detect the concentration and/or the status of one or more polluting substances (for instance by assuming a specific colour that signals a corresponding concentration level thereof in the water), or the use of environmental sensors. Especially in such a case, the structures could comprise a larger number of nets, delimitating more than one space each one intended for housing a specific type of polymeric substrate or sensor; alternatively, the two or more nets could be connected to each other (through corresponding coupling means, either removable or not, such as hooks) so as to define sorts of "pockets" among them, each one capable to house one or more substrates and/or one or more sensors.

By way of example, in the following it is described an example
of application of the anchorage structures according to the invention to re-implanting and monitoring Posidonia oceanica.

First of all, a step of determining the areas from which the cuttings to re-implant are to be drawn is carried out. In particular, the choice of the sites is conducted according to criteria of best quality and best productivity of the marine phanerogam, evaluating sites having relatively wide coverage, high phanerogam density, lack of pollution, and the bio-physical characteristics of the work sites.

Afterwards, a step of choosing the sites needing re-implant is carried out, by determining the areas actually lacking Posidonia oceanica through the evaluation of strongly regressing areas, wide areas of dead matte, presence of sandy bottom zones, absence or reduced presence of sea-bottom currents, and bays or coves sheltered from dominant winds.

The following step of drawing plants from the areas determined in the first step is carried out by competent scuba diver technicians, who manually carry out the explant when diving by using specific tools and devices ("small shovels" or "small spades", "water lances", "tweezers"), taking care not to damage the neighbouring habitat.

Afterwards, a step of sampling and selecting the cuttings to re-implant is carried out, with reference to their integrity, to the phenological condition, to the leaf state, to the integrity of the reproductive tissue and to the presence of roots. The cuttings are obtained, when necessary, following technique of separation, cutting and excision of the complex parts which are collected. The obtained cuttings are put in hydrothermal plexiglas recirculating tanks of sea water.

A step of execution of chemical treatments of the cuttings to re-implant is then carried out, in laboratory or in containing tanks, by giving terpenes, gibberellines, auxins, and cytokines based stimulating hormones which favour the maturation of the root apparatus.

Afterwards, a step of defining and marking the is carried out, that comprises a subdivision of the bottom into a series of lots containing one or more surfaces dedicated to the installation of the anchorage structures according to the invention and the related growth supports. Advantageously, the delimitation of each lot is pointed out in surface by proper buoy fields, each one of which has a buoy of a colour different from the others having the certification mark and an alpha-numeric code identifying the site. The position of the lots is reported on a georeferred
map by making a suitable IGM cartography, capable to schedule all the planned operations, included the post-installation monitoring.

After the steps described so far, process goes on with the re-implant of the phanerogam through the previously illustrated anchorage structures according to the invention, which may be advantageously quickly manufactured by means of predefined dies.

In particular, once the growth substrates have been prepared and cuttings selection is completed, the stuff is loaded onto suitable nautical means which gets to the implant site. Once the device placing position is reached, the scuba divers dive and place the anchorage structures on the bottom (in case of structures of the type shown in Figures 1-3, on the substrates previously placed on the bottom), so as to cover at best the to restore, i.e. in such a way that no spaces are left between one structure and another. The single cuttings are transferred in sealed hydrothermal containers, supplied with running sea water, placed on the nautical means.

After placing of the anchorage structures, a step of installation of the cuttings is carried out, that is manually made by the scuba diver technicians, avoiding to damage the sea-bottom or the same cutting. As said, the installation is carried out by inserting the cuttings into the meshes of the net of the modules, so that the rhizome and the roots are in contact with the sediment and are covered by at least 2/3 of their rhizome length. For protecting the young plant, during the early implant months metallic cages may be placed for preventing herbivores from attacking young leaves. Since it is expected, on the basis of previous experiences, a 50% mortality of the cuttings which are installed, each growth support preferably has eight cuttings in its mesh.

Finally, a series of steps of monitoring the transplantation state are periodically carried out, for evaluating the success of the operations in time and for making the needed corrections, included possible replacements of failures.

In particular, analyses attesting the general and specific density of single sites, analyses of morpho-structural growth, phenological analyses, lepidochronological analyses and analyses on the epiphytic communities, as well as the estimate of the reproductive tissue and of growth, are conducted. Through the examination of analyses conducted on sample sites, accurate interventions are executed for checking for the
presence of possible specific or generic stresses in the sites under intervention. Concretely, the monitoring steps are divided into non-destructive and destructive monitoring.

In non-destructive monitoring the following underwater measures are performed: count of residual cuttings, determination of the morpho-structural growth of the organisms, determination of the main growth structures, determination of the state of the apexes and estimate of the reproductive tissue, and qualitative evaluation of the epiphyte community.

In destructive monitoring the following operations are carried out on young specimens suitably planted in specific supports, through explant thereof and laboratory analysis for each specific area: measure of the phenological parameters of leaves (width, total length, presence of the ligula, length of the green tissue or edge, length of the brown tissue and of the white tissue - if any - and apex state), calculation of phonological parameters (mean number of leaves per tuft of each of the various categories and in total, mean length of leaves per category and in total, mean width of leaves per category and in total, leaf index per bundle and per m², coefficient "A").

For each re-implant site the percentage of development of orthotropic and plagiotropic rhizomes is evaluated, obtaining useful information on the growth time chronicle of the plant.

Finally, a step of specific control of the mortality is carried out, taking account of sample areas which may be adjacent or even remote, from the sites directly subject to the intervention steps. This procedure aims at providing a means of comparison between what happens in the sample transplantation areas and what happens in the seagrasses under restoration. The cuttings which are installed in such areas come from the main explant seagrass. Monitoring of the taking root of the aforesaid cuttings and on the periodic general state occurs according to the following scheme: whole duration of monitoring (to be determined depending on the evaluations), type of non-destructive monitoring, measure frequency (quarterly in the first year and yearly in the following years).

The advantages offered by the anchorage structure according to the invention are significant.

First of all, they allow cuttings of vegetable organisms, in
particular marine phanerogams, to be stabilised on the sea-bottoms, allowing a quick adaptation of the vegetable organisms to the substrate wherein they are implanted thanks to their capability of ensuring stability to the organism, as well as protection against the sea-bottom currents. As a consequence, the use of the structures according to the invention allows the restoration of the seagrasses of marine phanerogams and other stolon species damaged by anthropogenic activities, pollution and/or natural events, bringing the marine ecosystem under intervention back to equilibrium, again giving stability to the sandy bottoms, regularising the bottom currents, fighting the coast erosion, oxygenating the marine environment, and favouring the regeneration of the micro-habitats which allows numerous marine species to live.

Still, the use of the structure substrates prevent rhizomes from rotting. In fact, they allows the necessary absorption of water and, along with it, of the main nutrients which come into contact with the cutting rhizomes, and they ensure a better protection against pathogenic agents thanks to their chemical composition inhibiting proliferation of bacteria.

Moreover, the structure according to the invention allows plant germination and growth to be studied in a controlled environment, carrying out more easily a possible activity of monitoring of the seagrasses under restoration, since, once the reference tile has been marked, until its complete biodegradation, it is possible to monitor the cuttings implanted thereon minimising error probabilities.

Furthermore, thanks to the re-implant efficiently made through the structures according to the invention, it is possible to monitor the state of water and marine environments, since the marine phanerogams are a good biological indicator of the water quality due to the significant sensitivity of the marine phanerogams to chemical and organic pollution.

The preferred embodiments have been above described and some modifications of this invention have been suggested, but it should be understood that those skilled in the art can make variations and changes, without so departing from the related scope of protection, as defined by the following claims.
CLAIMS

1. Structure for anchoring vegetable organisms to underwater bottoms (10), characterised in that it comprises a framework (1, V, 4, 4', 5, 5'), to which one or more metallic nets (2, 2U, 2L), and one or more substrates (6), capable to contain one or more cuttings of at least one vegetable organism, are coupled, said one or more metallic nets (2, 2U, 2L) being capable to make said one or more substrates (6) come into contact with the bottom (10) when the framework is deposited on the same bottom (10), the framework (1, 1', 4, 4', 5, 5'), said one or more metallic nets (2, 2U, 2L), and said one or more substrates (6) being made of respective biodegradable materials.

2. Structure according to claim 1, characterised in that the framework (1, 1', 4, 4', 5, 5') is made of lean cement, preferably obtained with a special mixture of fine paste river conglomerate.

3. Structure according to claim 1 or 2, characterised in that said one or more metallic nets (2, 2U, 2L) are made of non zinc plated iron.

4. Structure according to any one of the preceding claims, characterised in that said one or more substrates (6) are malleable and substantially composed of coarse grain inert polymers, preferably wet with biostimulators, more preferably auxins based biostimulators.

5. Structure according to any one of the preceding claims, characterised in that the framework (1, 1', 4, 4', 5, 5') substantially defines a frame.

6. Structure according to claim 5, characterised in that said frame has a square shape.

7. Structure according to any one of the preceding claims, characterised in that the framework (1, 1', 4, 4', 5, 5') comprises a sole element (1).

8. Structure according to claim 7, characterised in that the framework (1, 1', 4, 4', 5, 5') comprises two or more elements (1, 1') coupled to each other through connecting mechanical means (5, 5') capable to allow said two or more elements (1, 1') to be reciprocally adjustably positioned when the framework is deposited on the bottom (10).

9. Structure according to claim 8, characterised in that said connecting mechanical means (5, 5') comprises one or more hooks, partially incorporated into the framework.

10. Structure according to claim 8 or 9, characterised in that
said connecting mechanical means (5, 5') are made of biodegradable material, preferably non zinc plated iron.

11. Structure according to any one of the preceding claims, characterised in that said one or more substrates (6) are, preferably removably, fixed to the framework (1, 1', 4, 4', 5, 5').

12. Structure according to claim 11, characterised in that said one or more substrates (6) are fixed to the framework (1, 1', 4, 4', 5, 5') through one or more connecting small blocks.

13. Structure according to any one of the preceding claims, characterised in that at least one of said one or more metallic nets (2, 2U, 2L) is partially incorporated into the framework (1, 1', 4, 4', 5, 5').

14. Structure according to claim 13, characterised in that said at least one metallic net (2, 2U, 2L) is coupled to a reinforcement (2'), preferably made of non zinc plated iron, buried in the framework (1, 1', 4, 4', 5, 5').

15. Structure according to any one of the preceding claims, characterised in that at least one of said one or more metallic nets (2, 2U, 2L) is removably coupled to the framework (1, 1', 4, 4', 5, 5'), so as to be temporarily removable from the same framework (1, 1', 4, 4', 5, 5').

16. Structure according to any one of the preceding claims, characterised in that at least one of said one or more substrates (6) is housed between two of said one or more metallic nets (2, 2U, 2L).

17. Structure according to any one of the preceding claims, characterised in that it further comprises mechanical means (8, 8', 9, 9') for fixing the framework (1, 1', 4, 4', 5, 5') to the bottom (10).

18. Structure according to claim 17, characterised in that said fixing mechanical means (8, 8', 9, 9') comprises one or more supports substantially having an U-like shape.

19. Structure according to claim 17 or 18, characterised in that said fixing mechanical means (8, 8', 9, 9') are made of biodegradable material, preferably non zinc plated iron.

20. Structure according to any one of the preceding claims, characterised in that it further comprises detector means, preferably means for detecting one or more pollutants, more preferably biological and/or instrumental sensors.

21. Structure according to any one of the preceding claims, characterised in that it further comprises at least one protection cage,
preferably made of biodegradable material, more preferably of non zinc plated iron, capable to surround said one or more substrates (6).

22. Structure according to any one of the preceding claims, characterised in that the framework (1, V, 4, 4', 5, 5') further comprises coupling mechanical means (4), capable to interact with corresponding coupling means (4) of an external structure.

23. Structure according to claim 22, characterised in that said coupling mechanical means (4) comprises one or more hooks, partially incorporated into the framework (1, V, 4, 4', 5, 5').

24. Structure according to claim 22 or 23, characterised in that said coupling mechanical means (4) are made of biodegradable material, preferably non zinc plated iron.

25. Structure according to any one of claims 22 to 24, characterised in that said external structure is an anchorage structure according to any one of the preceding claims.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. A01G33/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

A01G A01C E02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No</th>
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Date of the actual completion of the international search: 20 February 2007

Date of mailing of the international search report: 27/02/2007

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