CLAIMS

1. A system for underwater use, comprising:

an autonomous mother unmanned underwater vehicle (AMUV) and at least one auxiliary unmanned underwater vehicle (UUV),

the AMUV being configured for autonomously searching for and detecting undersea objects potentially present in an undersea region of interest (ROI), for generating object information relating to the objects detected thereby to enable identification of at least one object of interest (OOI) among the detected objects, and for selectively transporting said at least one UUV to at least within a predetermined distance from a location of said at least one OOI;

said at least one UUV being configured for interacting with said at least one OOI at least within said predetermined distance;

the system being further configured for providing verification information indicative of said interaction between said at least one UUV and said OOI;

wherein said AMUV comprises a communications system at least configured for transmitting said verification information.

2. System according to claim 1, including at least one of the following:

wherein the OOI is a mine and wherein said interaction comprises neutralizing the mine, and wherein said neutralization comprises destroying the mine; and

wherein the OOI is a mine and wherein said interaction comprises neutralizing the mine, and wherein said neutralization comprises causing the mine to detonate.

3. System according to claim 1, wherein said AMUV is configured for autonomously identifying at least one said OOI among the detected objects in said ROI by processing said object information.

4. System according to claim 5, including at least one of the following:

wherein said processing of said object information comprises comparing a geometrical form of the respective object with a geometrical forms corresponding to the OOI;

wherein said processing of said object information comprises comparing a geometrical form of the respective object with a geometrical forms corresponding to the OOI, and wherein said AMUV comprises imaging sensors configured for providing image data representative of said geometrical form of the respective object; and

wherein said processing of said object information comprises comparing a geometrical form of the respective object with a geometrical forms corresponding to the OOI, and wherein said AMUV comprises imaging sensors configured for providing image data representative of said geometrical form of the respective object, and wherein said imaging sensor include at least one of optical sensors and acoustic sensors.

5. System according to claim 1, wherein said AMUV comprises a propulsion system, a maneuvering system and a navigation system coupled to a control unit for enable autonomous operation of said AMUV.

6. System according to claim 1, including at least one of the following:

wherein said transmitted object information is processed remotely from said system, and wherein said communication system is configured for receiving control information verifying that a respective said object has been identified by the AMUV is OOI; and

wherein said transmitted object information is processed remotely from said system, and wherein said communication system is configured for receiving control information indicative that a respective said object has been identified remotely as being an OOI.

7. System according to claim 1, wherein said communication system comprises an antenna that is selectively deployable above the water surface for operation above the water surface while the AMUV is submerged.

8. System according to claim 1, including at least one of the following:

wherein said communication system is configured for transmitting and receiving data using at least one of the following types of communication:

cellular communication systems;

satellite telephone communication systems; and

satellite communication systems using broadband; and

wherein said system is configured for selectively engaging said at least one UUV to said AMUV at least while being transported by said AMUV, and for selectively disengaging said at least one UUV from said AMUV within said predetermined distance from the OOI.

9. System according to claim 1, including at least one of the following:

wherein said at least one UUV is a self-propelled remotely operated vehicle and is controlled by said AMUV;

wherein said at least one UUV is a self-propelled remotely operated vehicle and is controlled by said AMUV, and wherein said at least one UUV is connected to said AMUV via an umbilical tether;

wherein said at least one UUV is a self-propelled autonomous vehicle and is configured for operating autonomously at least when interacting with said at least one OOI within said predetermined distance;

wherein said at least one UUV is a non-self-propelled vehicle and is configured for being deposited within said predetermined distance at least when interacting with said at least one OOI; and

wherein said AMUV is configured for autonomously travelling to the ROI from a starting point remote from said ROI.

10. System according to claim 1, wherein said at least one UUV comprises an explosive charge configured for being selectively detonated in a manner to neutralize the respective OOI.

11. System according to claim 1, wherein said AMUV is configured for autonomously detecting said undersea objects present in an undersea region of interest, by providing detection information for each detected said object relating to a characteristic of said objects.

12. System according to claim 1, wherein said AMUV is configured for providing homing information regarding said location of a respective OOI to said at least one UUV, and wherein

said at least one UUV is configured for homing onto said location based on said homing information.

13. System according to claim 1, including at least one of the following:

wherein said AMUV comprises a ballast system configured for selectively enabling the system to bottom out;

wherein said AMUV comprises a ballast system configured for selectively and repeatably enabling the system to bottom out; and

wherein said control unit is configured for causing the system to bottom out for a predefined period.

14. A system for underwater use, comprising:

an autonomous mother unmanned underwater vehicle (AMUV), configured for autonomously searching for and detecting undersea objects present in an undersea region of interest, for providing detection information for each detected said object relating to a characteristic of said objects, and for providing homing information regarding a respective location of at least one object of interest (OOI) among said objects;

at least one auxiliary unmanned underwater vehicle (UUV) configured for homing onto and neutralizing said at least one OOI based on said homing information;

wherein said system is configured:

for providing said homing information from the AMUV to a respective said UUV,

for selectively transporting the respective said UUV via said AMUV, and for selectively releasing the respective UUV from the AMUV when said OOI has been identified, to selectively allow the UUV to home onto and neutralize said at least one OOI; and

for subsequently providing verification information indicative that said OOI has been neutralized;

wherein said AMUV comprises a communications system for communicating with a central control and configured for sending and/or receiving signals or data above the water surface, for at least one of:

transmitting said verification information;

transmitting object information relating to said objects to the central control.

15. The system according to claim 27, wherein the communication system is configured for transmitting said verification information, and wherein said AMUV is further configured for autonomously identifying said OOI according to predetermined criteria.

16. The system according to claim 27, wherein transmitting said object information to the central control enables the central control to identify said OOI or to confirm identification of said OOI by said AMUV according to predetermined criteria.

17. A method for underwater use, comprising:

(a) providing an autonomous mother unmanned underwater vehicle (AMUV) and at least one auxiliary unmanned underwater vehicle (UUV);

(b) operating the AMUV for autonomously searching for and detecting undersea objects potentially present in an undersea region of interest (ROI);

(c) identifying at least one object of interest (OOI) among the detected objects, and selectively transporting said at least one UUV to at least within a predetermined distance from a location of said at least one OOI;

(d) causing said at least one UUV to interact with said at least one OOI at least within said predetermined distance;

(e) providing verification information indicative of said interaction between said at least one UUV and said OOI;

(f) transmitting at least one of said verification information and said object information.

18. The method according to claim 31, including at least one of the following:

wherein the OOI is a mine and wherein said interaction comprises neutralizing the mine; and

wherein said neutralization comprises destroying the mine or causing the mine to detonate.

19. The method according to claim 31, including at least one of the following:

wherein said AMUV autonomously identifies at least one said OOI among the detected objects in said ROI by processing said object information; and

wherein said AMUV autonomously identifies at least one said OOI among the detected objects in said ROI by processing said object information, and, wherein said processing of said object information comprises comparing a geometrical form of the respective object with a geometrical forms corresponding to the OOI;

wherein said AMUV autonomously identifies at least one said OOI among the detected objects in said ROI by processing said object information, and, wherein said processing of said object information comprises comparing a geometrical form of the respective object with a geometrical forms corresponding to the OOI, and, wherein said geometrical form of the respective object is provided by image data of the respective object; and

wherein said AMUV autonomously identifies at least one said OOI among the detected objects in said ROI by processing said object information, and, wherein said processing of said object information comprises comparing a geometrical form of the respective object with a geometrical forms corresponding to the OOI, and, wherein said geometrical form of the respective object is provided by image data of the respective object, and, wherein said imaging data includes at least one of optical image data and acoustic data.

20. The method according to claim 31, including at least one of the following:

comprising the step of processing said transmitted object information remotely from said AMUV, and the step of receiving control information verifying that a respective said object that has been identified by the AMUV is OOI;

comprising the step of processing said transmitted object information remotely from said AMUV, and comprising the step of receiving control information by the AMUV indicative that a respective said object has been identified remotely as being an OOI;

wherein said verification information comprises imaging data of the respective said location subsequent to said interaction with the respective said OOI;

comprising causing the AMUV to selectively deploy an antenna above the water surface for operation above the water surface to transmit at least one of said verification information and said object information while the AMUV is submerged;

comprising causing the AMUV to selectively deploy an antenna above the water surface for operation above the water surface to transmit at least one of said verification information and said object information while the AMUV is submerged, and, comprising transmitting and receiving data using said antenna via at least one of the following types of communication:

cellular communication systems;

satellite telephone communication systems; and

satellite communication systems using broadband;

comprising selectively engaging said at least one UUV to said AMUV at least while being transported by said AMUV, and selectively disengaging said at least one UUV from said AMUV within said predetermined distance from the OOI; and

comprising remotely operating said at least one UUV by said AMUV or autonomously operating said at least one UUV at least when interacting with said at least one OOI within said predetermined distance.

21. The method according to claim 31, comprising causing the AMUV to selectively deploy an antenna above the water surface for operation above the water surface to transmit at least one of said verification information and said object information while the AMUV is submerged, and including at least one of the following:

comprising causing the AMUV to autonomously travel to the ROI from a starting point remote from said ROI, while the at least one UUV is engaged to the AMUV;

comprising autonomously detecting said undersea objects present in an undersea region of interest, via the AMUV, by providing detection information for each detected said object relating to a characteristic of said objects;

comprising providing homing information regarding said location of a respective OOI to said at least one UUV by the AMUV, and causing said at least one UUV to home onto said location based on said homing information;

comprising selectively causing the AMUV to bottom out;

comprising selectively causing the AMUV to bottom out repeatedly; and

comprising selectively causing the AMUV to bottom out for a predefined period.

22. The system according to claim 1, wherein said verification information comprises imaging data of the respective said location subsequent to said interaction with the respective said OOI.

23. The system according to claim 1, wherein said AMUV is configured for approaching said location, said AMUV comprising a sensor package configured for obtaining image data at the respective said location subsequent to said interaction with the respective said OOI to thereby provide said verification data.

24. A system for underwater use, comprising:

an autonomous mother unmanned underwater vehicle (AMUV) and at least one auxiliary unmanned underwater vehicle (UUV),

the AMUV being configured for autonomously searching for and detecting undersea objects potentially present in an undersea region of interest (ROI), for generating object information relating to the objects detected thereby to enable identification of at least one object of interest (OOI) among the detected objects, and for selectively transporting said at least one UUV to at least within a predetermined distance from a location of said at least one OOI;

said at least one UUV being configured for interacting with said at least one OOI at least within said predetermined distance;

the system being further configured for providing verification information indicative of said interaction between said at least one UUV and said OOI;

wherein said AMUV comprises a communications system at least configured for transmitting said verification information; and

wherein the OOI is a mine and wherein said interaction comprises neutralizing the mine.