

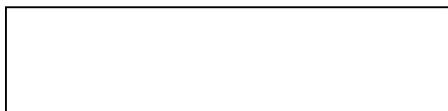
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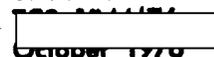
Scientific and Technical Intelligence Report

*Capability of the Soviets to Train Marine Mammals
for a Military Operational System*



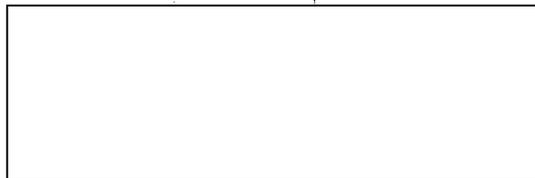
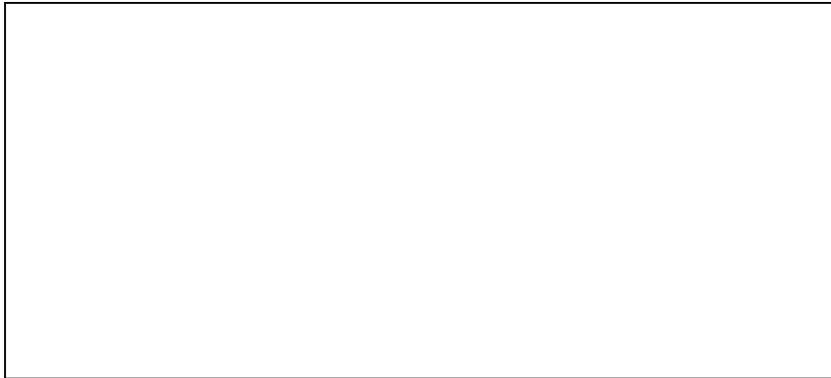
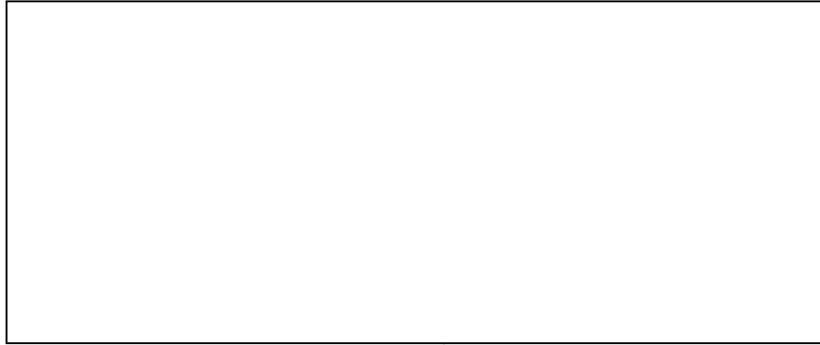
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October 1976

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**CAPABILITY OF THE SOVIETS TO TRAIN MARINE MAMMALS
FOR A MILITARY OPERATIONAL SYSTEM**

Project Officer

SI 76-10027K
October 1976

**CENTRAL INTELLIGENCE
DIRECTORATE FOR SCIENCE AND TECHNOLOGY
OFFICE OF SCIENTIFIC INTELLIGENCE**

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October 1976



Capability of the Soviets to Train Marine Mammals for a Military Operational System

Project Officer
[redacted]

PRÉCIS

Within the next year, the Soviets could train marine mammals to be used in military operational systems such as diver assistance and equipment recovery in the Black Sea. The next steps, possible within 2 years, might be training of the animals for more sophisticated tasks such as placement of packages on ships and ship protection, as well as for use in areas outside the Black Sea. The training achievements would be contingent on continuing Soviet success in maintaining a stable of healthy animals and overcoming past training difficulties.

The Soviets reportedly experienced difficulties in their early marine mammal training programs, but many of these difficulties appear to have been overcome. Useful experience has been gained in capturing and maintaining the animals and in providing veterinary care which are important prerequisites to behavioral training. Several new facilities to support the marine mammal program have been constructed. Recent evidence indicates that a Soviet capability to train the animals for use in the open-ocean, at least in limited military and intelligence-gathering roles, may now be available.

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PREFACE

[redacted] information indicates that the Soviet Union may be attempting to train marine mammals for military purposes. This report briefly reviews the prerequisites for establishing a successful training program, summarizes some of the major difficulties experienced during training, and reviews Soviet progress in surmounting such difficulties in order to develop operational programs. The operant conditioning and classical conditioning used to train animals are discussed in an Appendix.

Marine mammals can perform operational tasks which are well beyond even a trained frogman's capabilities. A man with swim flippers can maintain a speed of 4 to 5 knots for several minutes in quiet water; a dolphin can cruise at 5 to 6 knots for several hours and sprint to a speed of 15 to 20 knots for several minutes. From 150 feet to approximately 200 feet, a free swimming diver has about 5 minutes of working time if he wishes to return to the surface directly. According to US Navy decompression tables, he cannot make another dive for 12 hours. Using revolutionary equipment developed in April 1976, a diver can descend to 900 feet for up to 6 hours and require no decompression. Lack of mobility, the inefficiency of the mechanical hands, and inability of the diver to operate in murky water, however, places significant limitations on this experimental system. Dolphins, on the other hand, can dive to 1,000 feet, stay for several minutes, make repeated dives and ascend quickly without experiencing decompression problems. Whales are capable of diving to depths of at least 2,000 feet and can stay submerged for about an hour. Man's ability to localize auditory signals is poor in water; in murky water his vision is restricted severely. By contrast, some marine mammals which use sonar (both active and passive) can locate both sound-emitting and silent objects as small as one and one-half inches long.¹

The abilities of marine mammals can be "shaped" for operational purposes. For example, marine mammals have been trained to detect and intercept swimmers, to locate objects, to place instrument packages on moving or stationary targets, and to carry tools, lines, and objects from the surface to divers and between submerged divers.

This paper is concerned with mammals from the Order *Cetacea* (carnivorous, wholly aquatic mammals including dolphins and porpoises). The main focus is on *Tursiops truncatus*, the bottlenose dolphin, which is the only marine species known to be used by the Soviets for operational training.

Information was obtained from [redacted] open literature, and scientific interchanges with the USSR. This paper was prepared by the Office of Scientific Intelligence and coordinated within CIA. The cutoff date for information is August 1976.

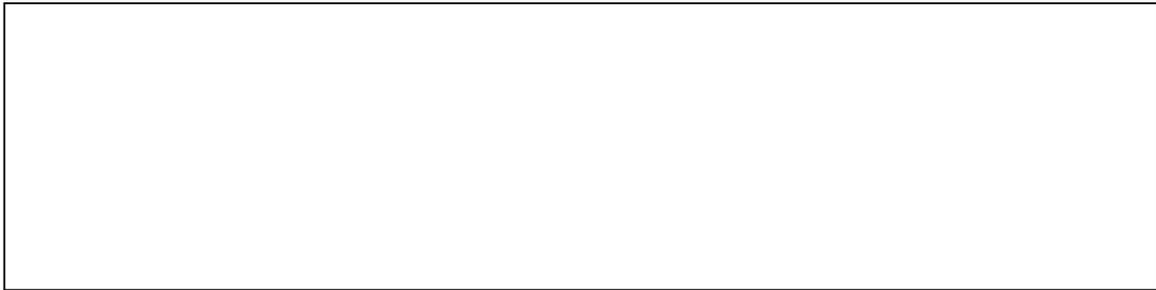
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CAPABILITY OF THE SOVIETS TO TRAIN MARINE MAMMALS FOR A MILITARY OPERATIONAL SYSTEM

PROBLEM

To evaluate the Soviet ability to train marine mammals for use in military missions in the open ocean.

SUMMARY AND CONCLUSIONS

Soviet knowledge of US successes and recognition of a marine mammal program gave impetus to the Soviet efforts in this field. The Soviets are developing operational systems based on an analysis of the unique capabilities of dolphins and their own needs. They are also assessing and replicating US systems while possibly developing countermeasures to certain US systems. The Soviets have written of the threat posed by the US effort, stressing that the most significant concern is the effect of mammals on submarine forces. For example, animals could be trained to attach a magnetic package to a submarine which could record information, transmit a tracking signal or explode.

At present, training for operational programs is done only in the Black Sea area. Such training probably has been intended to achieve a limited capability such as diver assistance or equipment recovery. [redacted]

[redacted] Successful programs in the Black Sea also may lead to the establishment of bases on the Soviet east coast, where temperature and other operational conditions are appropriate. The most likely place for such a facility would be near Vladivostok.

The early stages of the Soviet program were hampered by several problems. Existing field stations had to be remodeled and new facilities had to be built before research and animal training could commence.

[redacted]

The Soviet program initially faltered because of difficulties in capturing and transporting dolphins without harming them, a lack of expertise in maintaining dolphins in captivity and little or no expertise in dolphin veterinary medicine. Since sick or injured animals do not respond to training, a prerequisite for operational training was to overcome the above difficulties. Early difficulties also resulted from using inexperienced navy conscripts to train the dolphins.

The Soviets have several dolphin research and training facilities which are at least equal to those in the US in size and availability of holding space. In addition, the Soviets appear to be resolving some of the problems involved in maintaining healthy animals over the period of years necessary to develop operational programs.

Recent assessment of Soviet training skills shows some improvements. Evaluation of the abilities of [redacted]

[redacted] Acknowledging the limitations of generalization from [redacted] it is likely that the Soviets now have at least some good trainers, some of whom may not be in the Navy. There is still some question whether the Soviet Navy has used this expertise to train its dolphins, to improve the capabilities of its own trainers, or both.

DISCUSSION

GENESIS OF SOVIET MARINE MAMMAL RESEARCH

The major initial stimuli to the Soviet marine mammal research program probably were the reports on or allusions to the efforts and accomplishments of the US program. A brief discussion of several publications which the Soviets are reported to have studied may provide an insight into the nature of the threat which the Soviets perceived.

In 1964 Dr. J. C. Lilly's book, *Man and Dolphin*, was translated into the Russian language.² The main theme of the book was that dolphins were at least as intelligent as man and that two-way communication between the species would occur within two decades.

An excerpt from the book which addresses the possible military use of dolphins follows:

"Cetaceans might be helpful in hunting and retrieving nose cones, satellites, missiles, and similar things that men insist on dropping into the ocean. They might be willing to hunt for mines, torpedoes, submarines and other artifacts, to do scouting and patrol duty for submarines or surface ships, and they might carry their protagonist activities to the point where they can be used around harbors as underwater demolition-team operators, . . ."

The Soviets were aware of the US Navy's interest in marine mammals. In his book, Dr. Lilly acknowledged the help provided by the Office of Naval Research, Department of Defense. This acknowledgement may have been interpreted by the Soviets as an indication that the US Navy intended to use marine mammals to develop new weapons or to function as integral portions of weapon systems.

Such an impression also could have been fostered by an earlier book in which Harrison Matthews had lamented that, "now it seems that some people are proposing to prostitute their biological work on the Cetacea and involve the animals in human international strife by training them as underwater watchdogs to guard naval installations from frogmen or to act as unmanned submarines."³

In 1966, articles appeared in several US newspapers revealing the "fact" that the navy was training Kamikaze Porpoises,¹ a theme which has appeared

subsequently. As recently as 1974, the *London News* reported an unconfirmed incident in which "a dolphin planted a monitoring device on the hull of a Soviet nuclear submarine in a foreign harbor and collected it later so that the type of fuel the submarine was using could be discovered."⁴

Reportedly, the task of analyzing US unclassified literature and classified marine mammal research was assigned by the Soviets to the Office of New Technology of the General Staff of the Ministry of Defense. The head of the Bionics Department of the Office of New Technology was reported to have shown to a job candidate confidential reports in the Russian language concerning US Navy marine mammal research.⁵ The Soviets apparently had an effective collection effort, as US marine mammalogists visiting their counterparts in the USSR were surprised by the Soviets' familiarity even with obscure publications.⁶

From the analyses they performed, the Soviets evidently concluded that the US Navy had trained dolphins to perform military tasks successfully. In a 1975 article in *Krasnaya Zvezda*, Litenetskiy discussed the use of dolphins by the US Navy and its successes.⁷ It is certain that the Soviets regarded marine mammals as a potential military intelligence threat; they may have realized the potential use of the animals to gather data concerning submarines which, to some extent, would compromise the effectiveness of this important strategic force.

MARINE MAMMAL RESEARCH AND TRAINING

The Soviet State Committee for Science and Technology reportedly approved an Academy of Sciences proposal to make dolphin research a governmental responsibility in 1965.⁸ Published reports on Soviet marine mammal research have increased since 1964. There are three major areas of the Soviet program as indicated by the number and content of the research articles produced. US marine mammalogists have categorized 267 recent Soviet articles. Some were classified in more than one category. The three categories of interest to this paper are as follows: acoustics 106 (40%), hydrodynamics-

[redacted]

tasks.

[redacted]

Construction of the [redacted] was begun in 1965-66. It is now fairly extensive and incorporates several large research buildings, a 147-meter hydrodynamic runway, and large enclosed pens with both holding and training areas. (Figures 1 and 2) Inasmuch as land support for operational training need not consist of more than an ice house to store fish and a shed to store equipment, the research buildings probably are largely devoted to hydrodynamics and acoustic research.

[redacted] may indicate that training is occurring within the pens. [redacted]

[redacted]

The main goal of the behavioral studies has been identified as training animals to perform operational

related 78 (29%), and behavioral aspects 74 (28%).⁹ The remaining articles dealt with miscellaneous topics.

Facilities

The Soviet marine mammal research has been performed at various institutes and field stations. The institutes provide indirect support to field stations which perform applied research and operational training. All of the identified field stations are on the Black Sea. The field stations at Sukhumi, Bol'shoy Utrish, Karadag, and Pitsunda-Alakhadzy have been identified as being involved mainly in acoustics research. Although acoustics, physiology, and veterinary medical research also is pursued at [redacted] hydrodynamics studies are central to the research conducted there. In addition, [redacted] are suitable for training marine mammals for operational

[redacted]

tasks.¹⁴ To achieve this goal, the Soviets needed to remodel old facilities, or build new facilities, and to learn the intricacies of capture, maintenance, and training.¹⁰

Capture and Maintenance

Regular fishing fleets supply animals to the Soviet research stations. The fishermen initially were not trained in the procedures necessary to ensure the well-being of these animals. Even with researchers present to supervise the catch, many animals died during capture, transport, or soon after their arrival at the research facilities.¹⁵ [] reported that of 47 Turslops caught, only two survived.¹³ A report in

1974 indicated that of 15 animals caught, only two were alive after 2 weeks.¹⁴ Since most animals were injured or traumatized during handling, considerable time had to be spent nursing the animals back to health before effective training could begin.¹¹

The Soviets also apparently experienced numerous problems in trying to winter dolphins in open-sea pens on the Black Sea. [] [] that two tursiops were wintered for the first time [] in 1967-68. Reportedly, one animal was maintained for 4 years in captivity and another for 3 years at [] which indicate at least some capability was gained in wintering techniques.¹³ Nevertheless, as recently as the 1973-74 winter, the Karadag facility lost all but one of its

animals¹⁴ even though it also had heated basins.¹³ It is not clear whether the [] animals were maintained in open-sea pens, or were brought into a sheltered enclosure during the winter months. Some of [] animals may be wintered at the Batumi facility.

Turslops consume approximately 25 pounds of fish a day in temperate weather; in cold weather this amount increases dramatically. Feeding of the animals presents a logistics problem. Substantial quantities of fish, and the right kind of fish must be made available. Animals develop strong food preferences during captivity and generally will react to changes in the diet by refusing to eat. The Soviet suppliers at times did not provide the proper type of fish or follow the necessary hygienic conditions.¹³ One alternative to the logistics difficulties in providing sufficient fresh fish of the proper species is, of course, to use frozen fish, but this also has presented problems for the Soviets. Dolphins which are fed frozen or inadequately thawed fish develop stomach disorders which are frequently fatal. []

[] Soviet caretakers feeding partially-thawed fish to the dolphins.¹³

There is as yet no indication that the Soviets are developing any type of artificial food. An artificial food could eliminate the problems caused by inadequate thawing of frozen fish. Research in this area has been conducted by the US Navy.¹

An additional maintenance problem for dolphin researchers is the quality of veterinary care.¹³ Basic procedures such as prophylactic use of antibiotics, reportedly were not employed by the Soviets in spite of the fact that captured dolphins are quite susceptible to diseases.¹³ The significance of inadequate veterinary care is that sick animals do not respond to training. In general, veterinary care has been one of the major problems of the Soviet program. The Soviets now appear to be improving their veterinary care and resolving some of the problems involved with maintaining healthy animals.²⁹

Training Personnel

In 1967 Galina Shurepova became head of the Soviet applied research program [] She is a master of underwater sport and a former scuba diving champion. There is no indication, however, that she initially possessed any particular training skills or knowledge of sea mammals. Sabitov (fnu), a former

Soviet Navy officer and also a scuba diver, acted as her assistant. These individuals were in charge of a unit of navy divers—most of whom were conscripted personnel—who performed the everyday care and feeding as well as the training of the animals.¹⁶

The use of conscripted personnel for animal care and training may be a hinderance if the results of US experience are applicable to the Soviet case. Conscripted personnel, in general, lack the motivation, perseverance and attention to detail required to train animals. The reports of initial failures by the Soviets¹⁶ add credence to the hypothesis that conscripted personnel are not effective animal trainers.

Because of the difficulties encountered by the Soviets in training dolphins, Anna V. Durova, a circus trainer who had experience training seals, was appointed as a technical advisor. Her father, Vladimir Durov, reportedly had developed before World War II a system employing seals and sea lions to detect and neutralize mines and submarines.¹⁷ This system is probably the one which B.F. Skinner (a psychologist who founded operant conditioning and trained animals for the US military) alluded to but lacked supporting evidence.¹⁸ It appears that Anna was selected for her expertise and also because of her father's previous work in developing marine mammal systems.

Conversations with Durova in 1974 indicated that she felt that no reliable results had been obtained [] She felt that the large number of animals received for training was out of proportion to the small number of skilled handlers. The trainers annually were faced with an influx of new animals to replace the dolphins that had died during the winter. Many animals also were lost in several programs which attempted to train animals to return to their pens at the base after being released in the sea.²⁶ Certain of Durova's comments were critical of the trainers' abilities.¹⁶ Thus, there is still some question whether the Soviet Navy has used the civilian expertise to train either the trainers or the dolphins, although recent evidence indicates some accomplishments in the navy's training program.²⁷

Training Techniques

The US had several advantages compared to the USSR when it began its marine mammal operational program. In the US, experts were available who had worked with marine mammals in various oceanariums.

The Soviet Union did not open an oceanarium until 1974, and there was no pool of experts familiar with the training of dolphins.

The Soviets are known for having excellent circus trainers, but none was known to have worked with dolphins. Also, the ability of circus trainers and the effectiveness of their training techniques sometimes vary greatly from those needed for training animals to perform specific tasks. Circus trainers tend to build acts incorporating what the animal does rather than training the animal to perform other specific tasks. Circus trainers tend to be unaware of what actually is effective in their training technique and have developed many superstitious ineffective training behaviors to which they mistakenly attribute much of their success. Much of the circus trainers' effectiveness can be attributed to the operant conditioning procedures he unwittingly uses. The traditional Soviet circus training method also relies heavily on punishment and fear, both of which have been shown to be ineffective in training dolphins.^{1 15}

The US may have enjoyed an initial advantage in its program in that operant conditioning, which is an empirically based reliable method of training animals, was developed in the US. The Soviets philosophically reject operant conditioning because of its apparent contradiction with Pavlovian classical conditioning. Soviet dolphin research using operant conditioning appears to lack many of the refinements seen in Western research. The vast amount of US research examining and using operant conditioning is not present in Soviet open [redacted] literature.¹² (An appendix discusses operant versus classical conditioning as methods of training animals.)

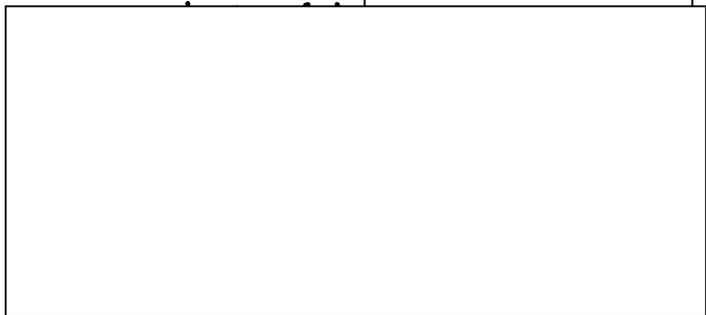
A brief examination of some problems encountered by the US program indicates the complexity and organizational problems involved in working with marine mammals. Similar difficulties may have been or may continue to be encountered by the Soviets. Some of the difficulties encountered in the US program are illustrated in the following examples.¹ A target buzzer for a dolphin attracted sharks and the dolphin turned out to sea and ignored the recall signal.² Lights and noises in the operational setting did not match conditions existing during training and thus led to a 2-day delay before a dolphin performed adequately.³ A trained dolphin inexplicably failed to perform but upon subsequent examination, it was revealed that the target buzzer had failed to operate.⁴

Trained sea lions exhibited erratic behavior in recovering objects, but a subsequent study revealed that the fog and the accompanying darkness at the recovery site interfered with the animals behavior.⁵ Additionally, the pattern painted on the object differed from the pattern used during training.¹ Thus the fidelity between the training and the operational setting and stimuli, communication between the trainers and equipment suppliers, and knowledge of the limitations of the animals and equipment have hindered the US program, and these similar problems could be expected to be encountered by any bureaucratic organization such as the Soviet Navy.

From the Soviet experiments reported in the open literature, it is impossible to evaluate the competency of Soviet animal trainers, their training techniques or the efficiency which they may have dealt with problems such as those enumerated above. Censors reportedly remove most of the methodological section from technical papers before they are accepted for publication, and it, therefore, is unavailable for analysis. The methodological information is customarily conveyed through lectures and conferences. It is impossible, therefore, to determine the validity of even the limited results which are reported.

It is likely that, at least initially, the Soviets did not have the expertise in using complex conditioning techniques. Because some operant techniques have been adopted by Pavlovian-oriented scientists, it appears that the Soviets now have a rudimentary familiarity with the empirically based operant method of training animals. Much of the Soviet dolphin research requires behavioral responses similar to those demanded in US studies.⁹ These studies necessitate the use of some form of operant conditioning. Although the Soviets use some operant techniques, they continue to use Pavlovian terminology and concepts in discussing their experiments.

An indirect assessment of Soviet training capabilities was possible. T [redacted]



[redacted]

training.²⁵ In a recent report, the civilian trainers at Moscow State University found that the use of an infant dolphin greatly facilitated successful training of these five stages of behavior. Since the Soviet Navy maintains its animals in bisexual groups, it also may be interested in using infant dolphins in its program.²⁴

Along with, or perhaps because of, the intimate contact with the animals, the Soviets stress that taming and training are done best by one man. While acknowledging the desirability of having the animal respond to several trainers rather than one specific trainer, the increase in effectiveness, as judged by the Soviets, appears to warrant the one-to-one relationship.²⁰ A team concept of training is more appropriate for an operational system. If several men were able to handle the animals, missions would not be delayed because a handler was sick, on vacation, or left the service. The initial lack of successful training may have convinced the Soviets that they could not afford the added utility provided by the use of multiple trainers.

The Soviets appear to be aware that, in addition to fish, effective reinforcements for the animals can be obtained through interaction with men, play objects, and a large swimming area.²⁰ The Soviets do not appear to apply the reinforcers selectively, i.e., dependent on the performance of the animal. Provision of non-food reinforcers is not made contingent on the animals behavior; thus, much of the usefulness of the reinforcer is lost.

Information needed for training marine mammals is widely available in the US open literature. The Soviets are aware of this literature. Nevertheless, awareness does not necessarily coincide with application. In several studies, the Soviets have reported an inability to train animals.^{20 21} In other studies, it is apparent that the five major steps in operant training have not been applied.^{22 23}

Briefly, major steps in the application of operant techniques in order to maximize results requires: (1) precise detailed description of behavioral goals, (2) planning of steps which allow shaping of animals so that they perform tasks reliably, (3) accurate recording of behavior with concurrent analysis in order that animal's progress, or lack of it, can be detected, (4) change from continuous reinforcement to variable intermittent reinforcement schedules, and (5) variation of tasks in order to maintain the animal's motivation.

[redacted]

[redacted] was given the task of training two Beluga whales to perform a two-choice discrimination task in order to assess the sonar capabilities of the animals. These animals had not been trained or used in prior experiments.⁹ The training took place in an area remote from US trainers in order to isolate [redacted] as much as possible.

During the training, [redacted] did not verbalize or acknowledge operant conditioning techniques, but he used them effectively. Especially noteworthy was his effective use of a "bridging stimulus," a signal to the animal that it has performed correctly and will get a reward. The bridging stimulus must be presented immediately after the correct behavior is performed and is used to reinforce the animal when provision of an immediate reward is inconvenient or undesirable. Other operant techniques such as "shaping" and "time-outs" also were apparent in his training regime.

Within 3 weeks, the animals were stationing, gate training, and performing an initial discrimination. Considering his evident skill as a trainer, and the recently reported accomplishments of Soviet marine mammal trainers,^{27 28} the Soviets now have at least a limited training expertise to implement a marine mammal operational system. [redacted]

Unlike US training, Soviet taming and training emphasize physical contact with the animal. The standard Soviet taming techniques involve sequentially training animals to: (1) eat food from the hand of the trainer; (2) permit its body to be touched while feeding; (3) allow the trainer to touch, grasp, or hold it; (4) engage in active play with the trainer; and (5) allow forceful manipulation of its body. Rough games are viewed by the Soviets as a special way of establishing intimate contact. Reports of trainers beating on animals' rostrums are included in descriptions of

An apparent contradiction exists between the results of the evaluation of the skills displayed by [redacted] and his evaluation of the Soviet program. At one time, [redacted] was shown a photograph of a pilot whale placing a marking device on a US torpedo. He stated that it could take the Soviets 20 years to get to that stage.² Yet our evaluation indicates that Soviet civilian trainers and consultants to the military program possess some ability in training. Part of this discrepancy may be attributed to the Soviets' inability to capture and maintain a whale which, until recent years, was considered impossible. [redacted] therefore, may have been referring to training a pilot whale rather than training marine mammals in general.

IMPLICATIONS

The presence of the submarines at [redacted] and the reports of training involving physical contact with the trainer support the hypothesis that one of the Soviets' operational goals is to develop a diver assistance program. The Soviets also have attempted to train their animals to respond to radio controls and to carry sensor packages.¹¹ [redacted]

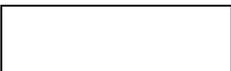
[redacted] possible portable habitats. If this interpretation is correct, the Soviets are also developing a capability to transfer and maintain the animals at temporary locations. The Soviets are fully capable of relocating the animals and have transported marine mammals by plane, boat, and truck. Portable habitats would permit maintaining the

animals for indefinitely long periods at locations remote from the main facility, as would be required for certain operational activities.

The Soviets most likely will develop their own operational programs, will continue to assess the US marine mammal program, and probably will attempt to replicate US successes in order to develop countermeasures to certain programs. The Soviets first would attempt to use the animals in their home waters in tasks such as diver assistance or object recovery. Once the Soviets are successful with these tasks, they may expand their program beyond the limits of the Black Sea. The Soviets would expand their training facilities to other waters under their control, such as on the east coast. The Vladivostok area appears to be best suited for a marine mammal facility. Adequate naval support is present in this area. A base in Vladivostok could serve as a home base for operations in areas such as the North Pacific, Sea of Okhotsk, and the Sea of Japan.

After initial successes, the Soviets may attempt to train their animals for more difficult tasks such as guarding ships in international waters or attaching packages to foreign vessels in order to record information, to provide a tracking signal, or to damage the vessel.

The Soviets could within the next year train animals to perform reliably in the Black Sea such tasks as object recovery or diver assistance. Within 2 years they could begin using the animals in other ocean areas and have animals trained to perform more difficult tasks.



APPENDIX

Training Methodology—Operant vs Classical Conditioning

Comparison of the conditioning paradigms will clarify the differences and similarities between operant conditioning mainly used in US research and classical conditioning which predominates in the USSR. The standard procedure of operant conditioning involves giving the organism which is being trained a reinforcement immediately after it performs correctly. The immediacy of the reward and the performance of behavior are the key elements in conditioning. By rewarding successfully closer approximations to a desired behavior an animal can be "shaped" to perform a new behavior. Thus operant conditioning depends on the animal emitting some aspects of desired behavior.

In classical conditioning, one stimulus—the conditioned stimulus (CS)—is paired repeatedly with a second, unconditioned stimulus (UCS) until the CS by itself elicits the response normally elicited by the UCS. The key elements in classical conditioning are that the CS immediately precede the UCS and that the interval between CS and UCS presentation be as short

as possible. In classical conditioning, the sequence of events is not dependent on the animal's behavior.

Important properties of the two methods can be combined. Operant conditioning requires that the reinforcement be contingent on the occurrence of the desired response or behavior. In classical conditioning, a new stimulus ultimately takes on the properties of a natural, unconditioned stimulus and elicits the same response. In advanced conditioning trials, components of both classical and operant conditioning appear. A classically conditioned stimulus may be used as a "secondary reinforcer" in an operant conditioning trial to inform the animal when it has performed correctly. This reinforcer can then be used as the stimulus for training different responses. For example, the use of a whistle as a secondary reinforcer for food makes it easier to "reward" the hungry animal immediately after it has performed the correct behavior and to encourage it to perform an additional desired action.

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