

REPORT ON THE ACTIVITIES
OF THE
JACKSON HOLE BIOLOGICAL RESEARCH STATION
SUMMER 1961

L. Floyd Clarke, Director

PHYSICAL FACILITIES

There were no major changes or additions to physical facilities of the Station during the past year. The principal improvements involved the purchase of a number of pieces of needed equipment. These include three new tables for the zoology laboratory and one for the botany laboratory, and also a number of new chairs with metal construction for use in the zoology laboratory as replacement for wooden chairs that were discarded. In addition 18 new metal folding chairs were purchased for use for Station seminars. This proved to be very convenient. Previously chairs had to be carried from the laboratories and various cabins. Two major additions to the equipment were the purchase of a new Ford truck to replace the 1950 Dodge and a new 12 foot boat to be used primarily in connection with limnological studies on beaver ponds and other small bodies of water. A larger boat is also available for use on the larger lakes. A new electric stove was purchased for the director's cabin, and the gas stove was transferred to the laboratory for use as a drying oven and to take the place of hot plates. Some general tools and an extension ladder were purchased for the use of research workers.

The equipment presently at the Research Station is being built up to the point that it can take care of most of the research needs of the investigators coming to the Station. With a truck, a suburban carryall and a station wagon, the transportation needs are fairly well taken care of.

The change in the road which is now so close to the Station did not constitute as much of a handicap to the Station as was initially anticipated. This was due, in part, to the fact that the Station fence was moved parallel to the highway in such a manner that it discourages large numbers of fishermen and other tourists with no interest in the Station from entering the grounds.

The Station is in serious need of two improvements:

1. Construction of a room to serve as a seminar room, library and reading room. The weekly seminars have been held in the living room of the home of the director, and the space available is not adequate. This room will be constructed either as a separate building or as an addition to the laboratory.

2. Construction of a log building to serve as bachelor quarters for research workers to replace the existing bunkhouse.

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Ontogenesis of Secretion in the Skin of the Tiger Salamander

Paul B. Roofe
University of Kansas
Project Number 116

One hundred ten larvae of Amblystoma tigrinum melanosticum were used to determine the approximate stage at which time the skin glands of the tiger salamander start secreting. It was determined that the serous glands (poison-venom) do not secrete upon stimulation either naturally or artificially until the animals are in the very last stages of metamorphosis. Shortly after metamorphosis there is a profuse secretion of the poison glands as well as some increase of mucous secretion upon stimulation. The poison glands are chiefly located in the dorsal two thirds of the body skin whereas the mucous glands are on the ventral one third. The chief stimulus was an electrical shock of three volts, with a frequency pulse of twenty per second, a duration of ten milliseconds. Poison glands are more effective on the predator in those animals that are non-aquatic. This is nature's way of protecting the metamorphosed tiger salamander. The poison glands are three times the size of a mucous gland; each possesses a blood capillary ring (net).

Supported by the National Institutes of Health.

SEMINARS

Seminars were held each Thursday evening at 7:30 P.M. in the home of the Director. They were well attended by Research Station personnel, Student Conservation Program students, and other biologists who happened to be in the area at the time. The number of biologists attending varied from 40 to 50. This was more than the facilities would accommodate except by some standing or sitting on the floor. The space problem for seminars is a critical one. I sincerely trust we will be able to provide new accommodations before we have to restrict attendance. Each seminar was followed by an informal period of discussion and refreshments.

The following is a list of the seminars presented.

Kenneth B. Armitage and Brad House - Research in the Antarctic.
Robert W. Lichtwardt - Evolution of Fungi.
Elliott A. Maynard - Evolution of Insects.
Glenn A. Noble - Stress as a Factor in Parasitism.
Norman C. Negus - Population Dynamics of Rodents.
J. Gordon Edwards - Ecology of High Altitude Insects.
Howard E. Evans - Comparative Ethology of Digger Wasps.
Margaret Altmann - Social Roles in Animal Groups.
Kenneth L. Diem - Plant and Animal Distribution as Affected by Geological Formations.

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All of the seminars this year were excellent in quality, eliciting discussion and critical evaluation. The research workers presenting the papers as well as those listening profited not only from the reports but from the discussions which followed. The group this year was probably the most enthusiastic and stimulating we have had this far.

LIBRARY

The library books and journals are readily available for Station personnel. Some new books have been acquired and all subscriptions to periodicals continued. Current periodicals are placed in the laboratory for examination before being placed in the stacks. Reprints continue to come in from research workers of previous years. These together with publications of the Grand Teton National Park and the Forest Service are made available to investigators.

Duplicate copies or summaries of all reports of research workers are prepared for use of the personnel at the Station. One copy is kept on file in the Department of Zoology and Physiology at the University. A list of the reprints of publications which we have available on research conducted at the Station is included as an appendix to this report.

COOPERATION WITH OTHER AGENCIES AND INDIVIDUALS

Participation in the Jackson Hole Cooperative Elk Studies was continued during 1960 and 1961. Dr. Kenneth L. Diem spoke on "The Role of Research in Studying the Jackson Hole Elk and Its Habitat" at the January public meeting held in Jackson. He also participated in one aerial survey in June, conducted by Grand Teton National Park in cooperation with Teton National Forest, concerning the movement of elk from winter to summer ranges. In July with other members of the technical committee, Dr. Diem took part in a four day horseback tour of the elk summer ranges.

The pocket gopher study initiated under the direction of Dr. Kenneth Diem and Dr. Garth Kennington is being conducted on vital summer ranges for the Jackson Hole elk herd. Cooperation in this project was outstanding from Mr. Robert Bendt, Grand Teton National Park; Mr. Robert Casebeer, Teton National Forest; Mr. Dale Nuss, Yellowstone National Park; Dr. David Love, U.S. Geological Survey; and numerous other personnel of Grand Teton National Park, Teton National Forest, and Yellowstone National Park. Their helpful assistance and advice were invaluable in the preliminary stages of this project.

On several occasions Park Service representatives contacted research workers at the Station for information useful to them in connection with the Park Service duties. Individuals and private corporations also requested and received advice on biological problems from specialists at the Station. As examples of some of the types of problems with which the Biological Research Station assisted are the following:

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1. A critical fisheries problem involving the death of large numbers of fish in Two Ocean Lake. Station personnel helped with the study on the Lake and the identification of the parasites and fungus responsible for the disease.

2. Infestation of cabins of the Jackson Lake Lodge corporation by ants. Control measures were suggested.

3. Recommendations were made to several individuals concerning the problem of controlling bats infesting buildings in the region.

4. Advice was given with respect to factors responsible for the failure of individual fisheries within the area.

Other examples could be cited.

As in previous summers the Station had many visits by scientists and other individuals interested in the Station. We were indeed fortunate last year to have a visit by Dr. and Mrs. Fairfield Osborn. Dr. Osborn is President of the New York Zoological Society, which cooperates so effectively with the University of Wyoming in the operation of the Station. He discussed with the Director and individual research workers many of the problems of the Station and gave valuable advice for the improvement of our operation.

Many scientists came for special consultation with investigators at the Station. We always encourage such visitations and profit much from them. No attempt will be made to list the eminent scientists who visited us.

COOPERATION WITH THE PARK SERVICE IN DEVELOPMENT OF A PLAN OF RESEARCH IN NATIONAL PARKS

Mr. Howard R. Stagner, Chief Naturalist of the National Park Service, corresponded with the Jackson Hole Biological Research Station for assistance in developing a research program for National Parks and more specifically for Grand Teton National Park. This was undertaken in connection with a projected expansion of research within National Parks. Discussions were held at the Biological Research Station and at Grand Teton National Park Headquarters with Mr. Stagner, Superintendent Bill, Assistant Superintendent Moore, Biologist Robert Bendt and others concerning this program. At the suggestion of Mr. Stagner and the administrators of Grand Teton National Park, the Director of the Biological Research Station with the assistance of Dr. Kenneth L. Diem, Professor of Zoology and Game Management at the University of Wyoming, the investigators at the Station, and Dr. David Love of the U.S.G.S., prepared a report which was submitted to the Superintendent of Grand Teton National Park. This report outlines some of the major research problems which might be undertaken. Because of the pertinence of this information to the development of the research program of the Biological Research Station as well as Grand Teton National Park, it is being presented in full below.

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Suggestions for Developing a Plan of Research for Grand Teton National Park

Introduction

An organized research program, keeping in mind the basic purposes of the Grand Teton National Park, will be of tremendous importance to efficient and effective operation of the Park. Far too little factual information has been available as a basis for developments within the Park. Projects which the Park Service should be interested in might be considered under two major heads, (1) those in which there is an immediate need for information of a specific nature to help determine plans and policies of the Park, and (2) long range projects which will develop a backlog of information available for the use of the Park and all other agencies and individuals who may have need for it in connection with future research projects and application to problems which arise. Successful management including the conservation of the natural resources within the area as well as the utilization of these resources for recreation requires facts. These facts can be obtained only through an effective program of research. Not only will such a research program contribute to the preservation of the natural environment but will furnish effective background for the use of these resources by the public for their enjoyment and education.

In addition Grand Teton National Park also furnishes excellent opportunity for the development of research projects of wide scientific value. As one aspect of research in the national parks, a very significant practical contribution can be made in the evaluation of management programs involving human welfare. For example, plant and animal populations in the parks generally have not been exposed to chemical herbicide and pesticide controls and for this reason are of significant comparative value.

An overall plan of research needs to be developed so that the individual research projects can be set up in such a way as to make a direct contribution to this plan. Such a plan should constantly keep in mind the basic policies of the Park. It should include studies of the preservation of the natural areas, the development of an effective interpretive program and the effective administration of the park for public use. This plan of research might well include the following major subdivisions--biological, geological, and archeological. While the Biological Research Station has emphasized the first of these major subdivisions, the other major subdivisions have been included where they could be effectively integrated with the biological research program.

Biological

Taxonomy and Distribution

A fundamental part of almost all biological research is the collection and identification of all kinds of animals and plants. It is here suggested that identification of the flora and fauna of each of our National Parks be encouraged at the earliest opportunity. All

subsequent studies, i.e. ecology, physiology, ethology, wildlife conservation, management of fish, game, and plant life in the Parks, will utilize the information provided by these identification studies. Much work concerned with this subject has already been completed by research workers at the Biological Research Station and others, but there is indeed much more work to be done.

As a result of the activities of Grand Teton National Park biologists and the research workers at the Station, an extensive plant collection has been made and is now available for use at the Grand Teton National Park Headquarters. In its present state, it is of particular value for identification of plants within the area. Much additional work needs to be done on the distribution of the plants within the Parks. Noteworthy among the published research projects are those of John F. Reed on the vegetation of the Wildlife Range and Biological Station areas, and John and Frank Craighead on mapping and general distribution of the plants in the same areas. Other distribution studies either published or in progress include the work of Alan A. Beetle, Charles C. Laing, and others.

Much work has been completed and published data is available on the fauna of the area. Only very limited studies of invertebrates have been made including certain groups of insects, spiders and molluscs. Vertebrate studies have emphasized the economically important game animals. To obtain a realistic perspective of the animal communities in the Parks intensive studies need to determine relative abundance, geographical and seasonal distributions, and life histories of all invertebrate and vertebrate animal forms.

Ecology and Behavior

A definite program of ecological research should be initiated which would be organized with respect to (1) relations between individuals of the same species, and (2) relations between different species of both plants and animals. Such studies should also include the influences exerted by one type of man's use as related to other types of man's uses and man's use as related to the flora and fauna of the Parks.

Of immediate application would be ecological investigations relating to proposed locations of highways, campgrounds, trails, picnic areas, boating facilities and activities, visitor centers, etc. Information from such investigations would provide Park management the opportunity to more accurately evaluate all proposals with respect to:

1. Influence of land drainage associated with highway projects on the water tables and on plant and animal life of the area.
2. Disturbance influence of locating campgrounds, highways, horse trails, picnic areas, boating facilities etc. in areas of great natural beauty, unique plant and animal populations, areas subject to excessive soil erosion, areas where sanitation disposal may be destructive to

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native flora and fauna, etc. Examples of research now in progress on such topics are those projects at Lake Solitude and Swan Lake.

3. Influence of plant diseases and pests in choosing campgrounds, visitor center locations, picnic areas, etc. where these diseases and pests, i.e. rusts, blights, leaf miners, budworm etc. may destroy the majority of trees in the foregoing areas. Specifically, a study of the aspen area east of Signal Mountain may determine reasons for size, longevity, and resistance to blights.
4. Influence of motorboats on colonial nesting birds, i.e. white pelicans and resting and feeding areas occupied by populations of trumpeter swans, sandhill cranes and waterfowl.
5. Influence of water fluctuations on fish, birds, vegetation and other organisms within the drainages of Jackson Lake.

The significance of the big game species within the area emphasizes the need for studies involving influences of soils, vegetation, insects, parasites, rodents, land use, etc. within a specific species or between various species. Excessive expansion of one species numbers may well cause the complete extinction of other species, i.e. the increased elk numbers in the Lamar Valley of Yellowstone and the decimation of the moose, beaver, and white-tailed deer in the same area. The future of Park mountain sheep populations involves similar competition problems. Studies of various ecosystems, i.e. willow habitat, could contribute valuable wildlife management information for sustaining these game animals.

The same thoughts may be expressed with respect to the fisheries resources. The ecology of the native cutthroat trout in the Snake River is of major importance in the face of mounting pressure to increase fish propagation to meet the growing numbers of fishermen.

The Grand Teton Park furnishes a unique opportunity for the study of the physiology of plants and animals at different altitudes with respect to influences of basic metabolism requirements as related to available food and water; effects of light on physiologic responses, behavior, morphology, etc.; effects of radiation at high altitudes with respect to development in organisms of special resistance to radiation, protective materials associated with high altitude organisms, etc. All of this information is basic for understanding the methods of adaptation and the requirements for survival with plants and animals.

Information concerning the behavior of many animals in the area is of great significance to proper management practices as well as to the contribution these animals will make or do make to public enjoyment. Many important studies on animal behavior have already been made. Noteworthy among these are the studies by Margaret Altmann on elk, R. H. Denniston on moose, and Kenneth Armitage on marmots. The present

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cooperative elk study presents an excellent example of ways in which ecological, taxonomic, and behavioristic information all correlate in a pattern of research of significance in connection with the development of a management plan for elk.

The identification of wood types in ancient stumps now above timberline, and determination of age of these stumps by carbon 14 dating would assist in determining the post-glacial and pre-Recent altithermal time and information useful in plotting climatic megacycles.

Archeological

A study of artifacts along the shore and near Jackson Lake, including the Lawrence, Nelson, Stewart and other collections from this area, as well as the material in possession of the Park Service would contribute to knowledge of early cultures of the Park. A study of the travois trails and migration routes, with special reference to the Conant Pass route around the north end of the Tetons would provide more knowledge of Indian use of Jackson Hole. Such studies will make available to the public artifacts which are now largely available only in private collections.

Geological

Significant in the interpretation of climate and environment existing during Pliocene time, and determination as to whether any part of the ancestral Tetons was present at that time would be an extensive collection and study of Pliocene mollusks, ostracods, diatoms, pollen, and vertebrate fossils from the Teewinot and possibly younger formations. This should be considered a long-range study by several people, perhaps a specialist in each of the forms. Material is abundant and well-preserved.

Valuable information for the interpretation of the volcanic history of both Teton and Yellowstone Parks may be obtained from petrographic and geochemical study of Miocene and Pliocene volcanic rocks in the Pilgrim Creek area. The Miocene rocks comprise the thickest (7,000 feet) nonmarine sequence of that age anywhere in North America. They are mafic and derived from local vents in and adjacent to Grand Teton National Park. In contrast, the Pliocene rocks are felsic in composition, are about 1,000 feet thick, and represent a completely different volcanic cycle.

A study of the Mississippian and Pennsylvanian faunas of the Berry Creek area in the northern part of the Teton Range will be of regional significance, for they will aid the comparison of faunas from other parts of the Rocky Mountain region. The faunas, consisting chiefly of marine brachiopods, are unusually prolific and well-preserved in this area and warrant extensive collecting.

Establish monument control points for determination of downward movement of valley floor as related to reclamation projects planned for outside Teton Park but which may adversely influence the natural values of the Park.

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STUDENT CONSERVATION PROGRAM

Two students from the Student Conservation Program of the National Park Service were assigned to the Research Station for eight weeks. These students worked under the supervision of investigators at the Station. They were Walter F. Brown and Floyd R. Sandford. Their principal project was under the direct supervision of Dr. Kenneth L. Diem. For details of this research work see the project summary in this report entitled, "Some Aspects of Plant and Animal Distribution as Affected by Geologic Formations." These boys prepared a very excellent detailed report of their research activities for the summer. In addition, both boys were given an opportunity to observe the research work of each principal investigator at the Station. Both Mr. Sandford and Mr. Brown were very helpful in connection with studies in fisheries biology and limnology.

In the opinion of the investigators at the Station as well as the Conservation students, the program this year was highly successful. All of the research workers felt that the students had profited very greatly from the research experience, and both boys expressed satisfaction with the opportunity which was provided. They made a very worthwhile contribution to the activities of the Station, helping out materially with a number of important research projects.

Other activities were provided by the Research Station for the Student Conservation Program group. One of these was an initial orientation program for the six students in the group living at 95 Ranch and the two students at the Research Station. The orientation program consisted of a general meeting which dealt with the function of the Research Station, some interesting aspects of the ecology of the area, and an attempt to acquaint the students with the more interesting common animals and plants of the area. In addition each student was given an opportunity to observe the research work of the principal investigators and to discuss these projects with them informally. The students attended the regular weekly seminars and in other ways participated in the activities of the Station. One of the important aspects of the activities of the Research Station in connection with the Student Conservation Program was to emphasize the importance of research in connection with conservation.

This seems to be a very worthwhile program and should be continued. The Director of the Station cooperated with Miss Lindy Hill, supervisor at 95 Ranch, and with Mrs. Elizabeth C. Titus in the organization of this cooperative program.

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FINANCIAL REPORT

1960-1961

November 1, 1960 - June 30, 1961

<u>Item</u>	<u>Budgeted</u>	<u>Expended</u>	<u>Carried Over To Next Year's Budget</u>
Research Projects	\$ 807.00	\$ 807.00	
Part-time Assistants	800.00	800.00	
Equipment	767.53	692.07	75.46
Supplies	564.19	36.96	527.23
Contractual	971.19	69.31	901.88
Travel	376.40	107.56	262.40
Fixed Charges	36.00	36.00	
Extraordinary Expense	58.84		58.84
	<u>\$4,381.15</u>	<u>\$2,548.90</u>	<u>\$1,825.81</u>

July 1, 1961 - November 15, 1961

<u>Item</u>	<u>Budgeted*</u>	<u>Expended</u>	<u>Unexpended</u>
Research Projects	\$ 837.00	\$ 837.00	
Part-time Assistants	1,600.00	1,400.00	\$ 200.00
Equipment	2,829.46	1,583.85	1,245.61
Supplies	1,127.23	455.69	671.54
Contractual	1,744.88	419.83	1,325.05
Travel	484.40	128.00	356.40
Fixed Charges	36.00		36.00
Extraordinary Expense	133.84	31.06	102.78
	<u>\$8,792.81</u>	<u>\$4,855.43</u>	<u>\$3,937.38</u>

*Includes money carried over from previous year, therefore, does not indicate amounts appropriated for one year.

Rent received in the amount of \$690.00 was placed in the General Fund of the University.

The New York Zoological Society contributed \$500 toward the Director's salary in the form of an honorarium.

Grants-in-aid in the amount of \$1,800 were given by the New York Zoological Society.

National Institutes of Health grant - \$2,722.00

National Park Service and Olympic Natural History Association supplied \$800.00 to support two students doing research under the Student Conservation Program at the Station.

Other projects not included here were supported by grants from various sources as indicated after project summaries.