coast of the United States," but R. E. Coker[6] reports a six-inch specimen taken in 1921 at Dauphin Island, Alabama, and L. L. Babcock[7] notes that J. E. Cotter has taken three-inch tarpon in a cast-net at Aransas Pass, Texas.

A Leptocephalus stage in the development of *Tarpon atlanticus* has not been seen, but is predicated by the 25-mm specimen, transitional between Leptocephalid and adult form, in the Bureau of Fisheries, Washington, which was taken off Beaufort, North Carolina. Such a stage occurs in allied genera, and is probable in this case also.

Meek,[8] in his "Migrations of Fish," suggests as probable that the spawning of tarpon takes place at sea far enough from the coast to demand a denatant drift of the pelagic eggs and larvae to the coast where early life is passed.

There is adequate foundation for the belief that *Tarpon atlanticus* spawns along the Gulf Coast of Florida. For many years past, during March, April and May, tarpon have schooled in considerable numbers in shoal waters from one half to one mile off the southeast shore of Sanibel Island, Lee County. These schooling fish remain in this locality for some time, and when feeding strike freely at live bait. Milt has been seen escaping from fish in play, and when brought to the release-hook quantities exceeding half a pint have been expressed from a single fish. So far as known, female fish have not been taken from these schools.

Local fishermen are familiar with small tarpon in creeks and brackish pools, and occasionally in inland pools which contain water only during the summer rainy season, and have no communication with salt water.

Young tarpon from 12 to 38 cm may be netted at any time from a large brackish pool on Sanibel Island. Seining this pond in April, 1933, yielded specimens 8.46 and 12.70 cm in length, and weighing respectively 10.5 and 12.5 grams. These young fish are probably of a year's growth, as indicated by examination of the scales.

The coincidence of schools of ripe male fish remaining for some time in this definite area, correlated with the abundance of very young tarpon in the pools and bayous of Sanibel Island, strongly suggests this locality as a breeding-ground. Opinion among local fishermen is unanimously affirmative on this point. Efforts to secure specimens in early stages of development are now being made and results will be recorded later.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE MEASUREMENT OF STEADINESS: A NEW APPARATUS AND RESULTS ON MARKSMANSHIP

THE apparatus shown in Fig. 1 is a modification of several previous forms described by Whipple[1] and Dunlap[2] for the measurement of steadiness in fine eye-hand coordinations. All these involve the essential idea of a series of holes, graded from large to small, and a stylus (electrically connected with a buzzer or counter), which is either thrust into or held stationary in the holes, errors or unsteadiness being counted by the number of contacts with the plate or side of the holes and registered electrically by a counter or buzzer. The present apparatus combines the best features found in the earlier models, with additional improvements, namely: (1) Use of a rotating dial so that the movement is always to the same point; (2) use of a fiber cover with a beveled opening to focalize the target hole in the brass disk; (3) use of a back target covered with white paper for visibility and insulation so as to standardize the distance of inserting the stylus in thrusting; (4) adjustability to the most convenient height for each observer; (5) use of a tapering, pencil-shaped stylus to afford clear vision of the point when approaching the hole, and (6) suggested use with a "Cenco" impulse counter,[3]

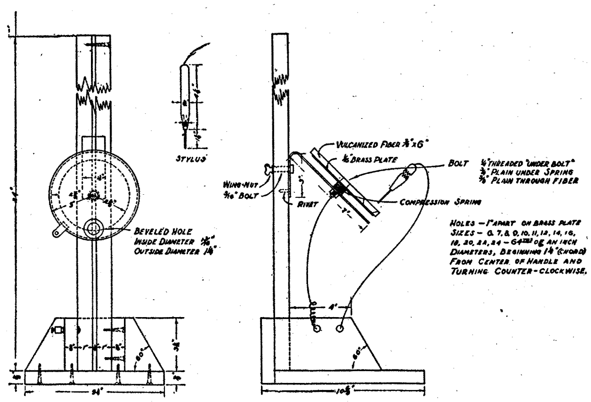

FIG. 1. Apparatus for measurement of steadiness.

[6] R. E. Coker. "A Record of Young Tarpon," *Copeia*, No. 93: 25–26, 1921.

[7] *Op. cit.*

[8] Alexander Meek. "The Migrations of Fish," p. 59. London, 1916.

[1] G. M. Whipple, "Manual of Mental and Physical Tests." Vol. 1, "Simpler Processes." Test 13, pp. 155–160. Baltimore, Warwick and York, 1910. Rev. ed. 1914, pp. 130–147.

[2] K. Dunlap, "Improved Forms of Steadiness Tester and Tapping Plate." *Jour. Exper. Psychol.*, 4: 430–3, 1921.

[3] Central Scientific Company, Chicago, Illinois.

which is fast enough to detect "scratch" hits in the thrusting movement (when it is used with 6 volt D. C.), and counts the total time in contact with the sides when the stylus is held stationary for a period of ten seconds (when it is used with a step down transformer to 10 to 12 volts of 60 cycle A. C., thus measuring 1/120ths of a second).

In work to date, a number of suggestions for a controlled testing situation have arisen: (1) Demonstrate the procedure to the observer and have him try the thrusting 5 times in the large hole, or in the stationary position, hold the stylus in position for two periods of 10 seconds each before starting the test. (2) Assume a stable, seated position, preferably on a stool with feet flat on the floor, left hand braced on table, right arm free from the side, and apparatus approximately in front of the right shoulder in the most comfortable position for moving the forearm through a distance of about six inches. (3) Perform thrusting and withdrawal movements at the rate of one second each in time with a metronome or clock, using ten trials in each hole, proceeding from the largest to the smallest, and repeating the series three more times. Slow up the thrusting movement just before entering the hole, to permit fine corrections of aim. (4) In the stationary position insert the stylus in the hole, close contact for ten seconds and proceed to each smaller hole, and repeat the series three more times. (Doubled for both stylus tests in order to increase accuracy.) (5) Polish the inside of the holes and the tip of the stylus at least once per series, using the fine "crocus cloth" which is obtainable at hardware stores.

This apparatus is of particular interest in relation to an analysis of steadiness in rifle shooting, where Dunlap's earlier form had been used by Spaeth and Dunham[4] to discover a coefficient of correlation of $.61 \pm .106$ between the thrusting type of measurement and score in rifle target shooting of 60 army marksmen, who ranged from poor to expert.

In view of the strong general trend against the various hypotheses of motor "abilities" or "aptitudes" as summarized by Seashore,[5] Adams[6] arranged to repeat and extend the work of Spaeth and Dunham under related conditions.

Other tests were added to form a battery of "steadiness" tests: (1) the Miles ataxiameter measuring postural sway, (2) the Beall and Hall ataxiagraph, for photographing tremor movements of the arm, and (3) a test of rifle steadiness. The ataxiameter[7] and ataxiagraph[8] are adequately described elsewhere. The rifle steadiness test was fashioned after the set-up designed by A. I. Gates[9] in his study on the analysis of marksmanship. A metal stylus is fastened securely to the muzzle of an army 22 rifle, regulation size, and fits into a clasp which is fastened by silk threads to levers which record vertical and horizontal movements on a kymograph drum during target aiming.

For purposes of scoring the records were clipped to the kymograph drum and a writing lever of the same construction as that used in the rifle steadiness test was connected by threads to two opposite dials of the ataxiameter. As the drum is slowly rotated, the experimenter moves this lever so that it accurately traces the kymograph record, translating it into millimeter units which are read directly from the ataxiameter. This technique proved to have approximately 98 per cent. accuracy. The ataxiagraph records were read by placing the transparent photographic film over a grid of penciled lines one mm apart and tabulating the number of deviations of the record as it crossed these lines.

TABLE I

INTERCORRELATIONS BETWEEN FIVE MEASURES OF STEADINESS

	Ataxiameter	Ataxiagraph	St. (thrust)	St. (position)
Ataxiagraph	.48			
Steadiness (thrust)	.44	.46		
Steadiness (position)	.54	.48	.59	
Rifle steadiness	.48	.54	.47	.48

N = ranges from 43 to 56 students in required military drill classes, the N in each case depending on the number of records lost through experimental failures, *e.g.*, photography.

As shown in Table I, the intercorrelations between these tests indicate that they are fairly consistent in measuring the same phenomenon, a result which is corroborated by a similar unpublished study by D. Stephenson at the University of Oregon. At present we can only say that these results on "steadiness" differ markedly from the intercorrelations on most other tests of motor skills, as cited by Seashore (*op. cit.*),

[4] Spaeth and Dunham, "Correlation between Motor Control and Rifle Shooting." *Amer. Jour. of Physiol.*, 56, 249–256, 1921.

[5] R. H. Seashore, "Individual Differences in Motor Skills," *Jour. General Psychol.*, 3: 38–66, 1930.

[6] The writers are indebted to the University of Oregon Military Department for cooperation in this work.

[7] W. R. Miles, "Static Equilibrium as a Useful Test of Motor Control," *Jour. of Industrial Hygiene*, 3: No. 10, 316–331, February, 1922.

[8] C. G. Beall and C. Hall, "A Vibration Recorder and Some of its Applications." *General Electric Review*, May, 1924, 297–303.

[9] A. I. Gates, "The Abilities of an Expert Marksman Tested in Psychological Laboratory." *Jour. Applied Psychol.*, 2: 1–14, 1928.

TABLE II
RELIABILITIES OF TESTS

Ataxiameter $r\frac{1}{2}-\frac{1}{2}$	.81
Ataxiagraph	.69
Steadiness (thrust)	.71
Steadiness (position)	.69
Rifle steadiness	.89

which showed an average correlation of from + .15 to .25.

Considering the rather low reliabilities, which ranged from .69 for the Steadiness (Position) test to .89 for the Rifle Steadiness test (as shown in Table II), these intercorrelations of Table I are quite significant.

Six members of the university rifle team have been tested and found to be very superior to the unselected group on the battery of steadiness tests. With but one exception the rifle team members surpassed the most steady of the unselected group of 50 men students enrolled in military drill classes. On the individual tests the rifle men placed consistently in the eighth, ninth and tenth deciles.

For the present we can only say that the strikingly superior scores of the rifle team may have resulted from the transfer of the intensive rifle training to which these men have been subjected, or following an "aptitude" interpretation, this stability may have been one determining factor in the selection of rifle team members. If such a "steadiness" aptitude exists it should be possible to select from a given sampling of prospects those who can become crack shots and those who will fail, with the reservation, of course, that other factors are probably of equal or greater importance in learning to shoot. Efforts are being made to secure data on the possibility of this type of selection and also upon the possible transfer of training from rifle shooting to the steadiness tests themselves. Further analyses are at present under way to determine the amount of daily and weekly fluctuations and improvements on the steadiness tests themselves and their relation to rate of tremor. Cooperation is invited to test out this type of measurement on practical skills which seem logically to be related.

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A CONVENIENT SLIDE WARMER

THE slide warmer pictured in the accompanying illustration grew out of the necessity, in my research work, of warming a few slides at a time. The warmer can be constructed by any laboratory technician who is handy with tools.

The warming compartment is constructed of roofing tin in the form of a box furnished with a close-fitting cover. The box portion is four inches square and seven inches long. The cover is four inches square and four inches long. In each of two sides of the box are three holes, each three eighths of an inch in diameter. In the bottom of the box is fastened a square piece of insulating material one fourth of an inch thick. An ordinary porcelain electric light socket

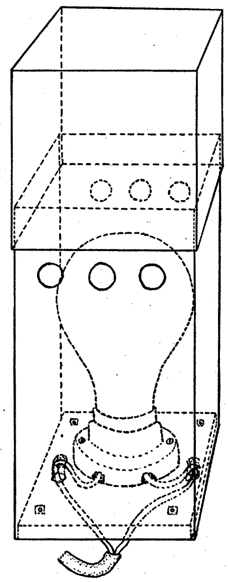

FIG. 1.

is attached to this material, and two holes, one fourth of an inch in diameter, are made in it to permit the passage of the electric wires. Coinciding with these holes, but larger, there are holes made in the tin of the bottom of the box so that the wires will be insulated from the metal of the box. The warmer is placed on its side when in use. A 50 watt bulb produces the necessary amount of heat to cause the paraffin ribbons to spread out within a few minutes after placing the slides on the side of the warmer.

The temperature inside the warmer can be varied in several ways. The cover may be placed on the box far enough so that the circular holes are partially or completely covered. The holes may be left exposed below the cover, as in the illustration, and the warmer placed on a table with one of the three-holed sides in contact with the table. The cover may be removed and allowed to be a fraction of an inch from the box. The temperature may also be varied by using a stronger or weaker bulb. This warmer may be used to keep the balsam sufficiently fluid to make satisfactory mounts.

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