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A SECOND CATALOGUE OF VARIABLE STARS IN GLOBULAR CLUSTERS COMPRISING 1,421 ENTRIES

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INTRODUCTION

It is fifteen years since the first catalogue of variable stars in globular clusters was published at this observatory by the writer in *Publications of the David Dunlap Observatory*, vol. 1, no. 4, 1939. The numerous requests we have received for this catalogue are evidence that it has proved useful to many workers.

The references to all globular cluster literature were brought up to date in 1947 by the complete listing in the *Bibliography of Individual Globular Clusters* (*David Dunlap Observatory Publications*, vol. 1, no. 20), but among this great number of references the data on variables were not selectively tabulated. Sufficient information has now been added to variable star data to justify a second edition of the variable star catalogue. The present catalogue, in a form similar to that of the first, aims to include all variables which lie within the visible limits of a globular cluster, whether physical members of the cluster or not. When such variables are known, or presumed to be, field stars, this is noted. A few of the variables in this catalogue are also included in the *General Catalogue of Variable Stars* by Kukarkin and Parenago, and its supplements.

Although it would be convenient to have prints of each cluster included in the present catalogue, the difficulty in accomplishing this is too great, and the reader must be referred to the original publications for these. The coordinates in x and y in seconds of arc are listed for practically every variable, but they do not provide, in many cases, as satisfactory identification as could be wished. It is not easy to select the exact centre of a cluster for the point of origin. In clusters where only one variable exists, the identification may be uncertain, and where large numbers have been found, different observers have not always used the same origin.

Table I contains a list, with 1950 positions, of 34 globular clusters which are not included in the main table of this publication. These are clusters for which I have no knowledge of a published search for variables, though several of them are under investigation at the present time. For the most part they are either clusters in the far southern sky, or else difficult objects which can be properly attacked only by a telescope of at least 100 inches. Table I and Table II (the 72 globular clusters which have been searched for variables) together contain the complete list of globular clusters in our galactic system as known to me at the present time. The remarks following Table I explain the changes in the list of globular clusters made since 1947.

TABLE I

THIRTY-FOUR GLOBULAR CLUSTERS NOT SEARCHED FOR VARIABLES

NGC	R.A. 1950	Dec. 1950	NGC	R.A. 1950	Dec. 1950
1261	$03^h\ 10^m.9$	$-55°\ 25'$	6388	$17^h\ 32^m.6$	$-44°\ 43'$
1841	04 52 .5	−84 05	6401	17 35 .6	−23 53
2158	06 04 .3	+24 06	6440	17 45 .9	−20 21
2682	08 48 .5	+12 00	6441	17 46 .8	−37 02
IC 4499	14 52 .7	−82 02	6453	17 48 .0	−34 37
5824	15 00 .9	−32 53	6496	17 55 .5	−44 15
5927	15 24 .4	−50 29	6517	17 59 .1	−08 57
5946	15 31 .8	−50 30	6558	18 07 .0	−31 45
6101	16 20 .0	−72 06	IC 1276	18 07 .5	−07 15
6139	16 24 .3	−38 44	6569	18 10 .4	−31 50
6304	17 11 .4	−29 24	6624	18 20 .5	−30 23
6316	17 13 .4	−28 05	6637	18 28 .1	−32 23
6325	17 15 .0	−23 42	6638	18 27 .9	−25 32
6342	17 18 .2	−19 32	6642	18 28 .4	−23 30
6352	17 21 .6	−48 26	6652	18 32 .5	−33 02
6355	17 20 .9	−26 19	6681	18 40 .0	−32 21
6380	17 31 .0	−39 03	6717	18 52 .1	−22 47

REMARKS ON TABLE I

Additions to 1947 list

NGC 2158 and 2682 (M67), formerly considered galactic clusters are listed as globular by Rosino and Becker respectively in the I.A.U. report of Commission 37, July 1954.

NGC 6380 has very recently been shown to be globular by Thackeray with the Radcliffe 74-inch; NGC 6558, on some early lists as globular (*Helwan Bull.*, nos. 21, and 22, 1921) is confirmed as globular by Thackeray; correspondence, 1954.

IC 1276, NGC 6642 and 6717 are considered globular by Baade and N. U. Mayall, correspondence, 1948.

Three other clusters not listed as globular in 1947 are now included among those with variables known, in the body of the catalogue. These are the new cluster found by Baade at R.A. $15^h\ 13^m.5$, and the clusters NGC 6235 and 6535 which vacillate between lists of globular and galactic clusters.

Deletions from 1947 list

The unnumbered object at R.A. $17^h\ 45^m.7$, Dec. $-60°\ 45'$, and NGC 6684 are now dropped from the globular cluster list. From a study of Harvard Southern Station plates, Shapley in a private communication states that they are not globular.

SUMMARY OF DATA ON VARIABLE STARS IN GLOBULAR CLUSTERS

NUMBERS OF VARIABLES

At present 1,421 variable stars are known in the 72 clusters for which there is a record of search. This does not include unpublished or suspected variables. There is a gratifying reduction in the number of variables listed as unpublished, from 99 in 1939 to 41 now. Furthermore in only four clusters

are all known variables unpublished. Some of the unpublished variables probably correspond to variables now published by other observers. Counted as suspected variables, in addition to unpublished suspects, are those numbered variables whose variation has been questioned, making a total of 48 suspected variables in 17 clusters. Only three clusters, NGC 5286, 5694, and 6584 have been searched in vain, but the variables found around NGC 6528 are considered by Baade to belong to the rich Milky Way field, so this cluster also is listed as one with no variables.

Since 1939 a total of 329 new variables has been added in 46 clusters. This number includes some which were formerly unpublished or suspected. Contrariwise, some stars formerly considered variable are now listed as doubtful, or have been dropped entirely. This number also includes a few formerly listed only in catalogues of galactic system variables, and now included for the sake of completeness. Nearly half the known globular clusters have been searched in the last fifteen years, which shows considerable activity in this field. The era of finding large numbers of variables in any one cluster seems to be pretty well over. Most of the variable-rich clusters were searched by Professor Bailey in the early years of this century, and there seems to be no more like them.

Table II gives a summary of the number of variables and number of periods known in the 72 globular clusters for which there is a record of search. It has been a little difficult to make this table homogeneous because the sources from which it is drawn were not uniform, and arbitrary decisions had to be made.

The first column of the table gives the NGC number, when available. In the second column is the total number of variables with published identification. The third column contains the unpublished variables (*u*), and the suspected (*s*). In a few cases the unpublished variables may no longer exist; when a worker publishes new variables in a cluster, it is sometimes not possible to find out whether they correspond with earlier, unpublished variables of another worker. The totals of suspected variables include those published only as suspects, as well as numbered variables which are now considered doubtful.

Table II, when used alongside Table I of the 1939 catalogue, gives a complete summary of variables in globular clusters to date. The fourth column, headed "New" is the number of variables which have been added since 1939, and the fifth column gives the name of the person responsible for their addition. In most cases this name is that of the discoverer, but occasionally it is that of a worker who first catalogued the variable in a globular cluster.

The sixth column of the table gives the total number of precise periods known, and the seventh, the number which are new since 1939. In the total of new periods I have included not only those periods which are completely new, but also revised periods in which the period as revised differs markedly from the earlier period. Small refinements of period, however, are not counted

TABLE II

SUMMARY OF VARIABLE STARS IN 72 GLOBULAR CLUSTERS

NGC	No. Vars.	Sus. Unpub.	New	Added by	Total Per.	New	Added by	RR Lyr	Prob. RR	Non-RR
104	11	2s	4	McKibben-Nail	3	0		0		9
288	1	2u	1	Oosterhoff	1	1	Oosterhoff	0		1
362	14		0		10			7	1	3
1851	2	1u	0		0			0		
1904	5	1s	1	Rosino	3	3	Rosino	3		1
2298		6u, 5s	0		0			0		
2419	36		0		0			0	23	5
2808		4u, 7s	0		0			0		
3201	77		17	Dowse (16) Wright (1)	59	59	Wright	58		2
4147	4		0		3			3		
4372		3u, 11s	0		0			0		
4590	31		3	Rosino	20	20	Rosino	20	10	1
4833	10	1s	10	Bailey (2) Swope (5) Dowse (2) Wright (1)	9	9	Wright	6	0	4
5024	43		4	v.d. Hoven v. Genderen	32	3	Oosterhoff (2) v.d. H. v.G. (1)	32	6:	1
5053	10		1	Sawyer	10	10	Sawyer (7) Rosino (3)	10	0	0
5139	164		1	Hertzsprung	153	3	van Gent (1) Oosterhoff (1) Kooreman (1)	137	3:	21
5272	187	2s	3	Schwarzschild(1) Sandage (2)	171	19	Martin	170	3:	3
5286	0		0		0			0	0	0
5466	18		4	Sawyer	18	18	Sawyer	18	0	0
5634	7		7	Baade	1	1	Baade	1	6	0
5694	0				0			0	0	0
Baade	5	5s	5	Rosino	0			0	5	
5897	4		4	Sawyer	0			0	5	
5904	97	1s	11	Oosterhoff	92	26	Oosterhoff	90	3	4
5986	1		0		0			0		
6093	7		4	Sawyer	1	1	Sawyer	0	3	3
6121	43		11	de Sitter	41	25	de Sitter, Oosterhoff	41	0	2
6144	1		1	Sawyer	0			0		
6171	24		0		0			0	22	1
6205	10	5s	5	Sawyer (4) Arp (1)	6	5	Sawyer (3) Kollnig-Schattschneider (1) Arp (1)	3	2	6
6218	1		0		1	0		0	0	1
6229	22		21	Baade (20) Sawyer (1)	0			0	20	2

TABLE II (*cont.*)

NGC	No. Vars.	Sus. Unpub.	New	Added by	Total Per.	New	Added by	RR Lyr	Prob. RR	Non-RR
6235	2		2	Sawyer	0			0	2	
6254	3		1	Arp	2	1	Arp	0	0	3
6266	26		0		0			0		
6273	4		4	Sawyer	0			0	2	1
6284	6		6	Sawyer	0			0		
6287	3		3	Sawyer	0			0		
6293	5		2	Sawyer	0			0	4	
6333	13		12	Sawyer	11	11	Sawyer	11	1:	
6341	16	1s	0		13	4	Oosterhoff	12		1
6356	5		5	Sawyer	0			0		
6362	15	2u	0		0			0		
6366	2		2	Sawyer	0			0	1	
6397	3		1	Swope	3	1	Swope, Greenbaum	1	0	2
6402	72		0		3	0		0	60	4
6426	11		11	Baade	0	0		0		
6522	9		9	Baade	8	8	S. Gaposchkin	8	0	1
6528	0		0	Baade	0			0		
6535	1	1u	1	Sawyer	0			0		
6539		1u	0		0			0		
6541	1		0		0			0		
6553	6	2s	6	Thackeray (5) M. Mayall (1)	3	3	Thackeray	3	0	3
6584	0		0		0			0		
6626	16		7	Sawyer	1	1	Sawyer	0	7	5
6656	24	1s	8	Sawyer	22	15	Sawyer	18	0	6
6712	12	3u	11	Sawyer (10) Oosterhoff (1)	1	1	Oosterhoff	0		2
6715	28		28	Rosino	0			0	24	4
6723	19		0		19	0		19	0	0
6752	1		0		0	0		0		
6760	4	2u	4	Sawyer	0			0		
6779	12		9	Sawyer (7) Rosino (2)	4	4	Sawyer (2) Rosino (2)	2	2	7
6809	6		4	King	5	5	King	5	1	0
6838	4		4	Sawyer	0	0		0		3
6864	11	5s	0		0	0		0		
6934	51		0		0	0		0	45	
6981	39		8	Sawyer (7) Rosino (1)	27	12	Rosino	27	7	
7006	40	1s	32	Hubble, Sandage	1	1	Hubble, Sandage	0	39	1
7078	93	8u? 2s	29	Rosino	61	0		60	28	2
7089	17		0		17	1	Sawyer	13	0	4
7099	4		1	Rosino	3	3	Rosino	3	0	1
7492	1	8u, 6s	0		0	0		0		

as new periods. The next column gives the name of the computer of the period.

The last three columns of the table give the types of variables in the cluster. Under the heading "RR Lyr" is given the number of RR Lyrae periods actually determined and published in the cluster. The following column gives the number of stars which are probably RR Lyrae type, though without published periods. A blank indicates that no definite number can be assigned at present. For example, in a cluster like NGC 6266 where no magnitudes of variables have ever been published, no estimate as to the number of probable RR Lyrae stars appears justified. The final column gives the number of non-RR Lyrae stars in the cluster. This number includes all stars, with both known and unknown periods, which present observations indicate are not RR Lyrae variables. Because these stars are of increasing importance, each one of them is listed individually in Table III. The total of the last three columns of Table II will not necessarily equal the total number of variables in the cluster, since some variables remain of unknown type.

Figure 1 shows the frequency distribution of the number of variables per

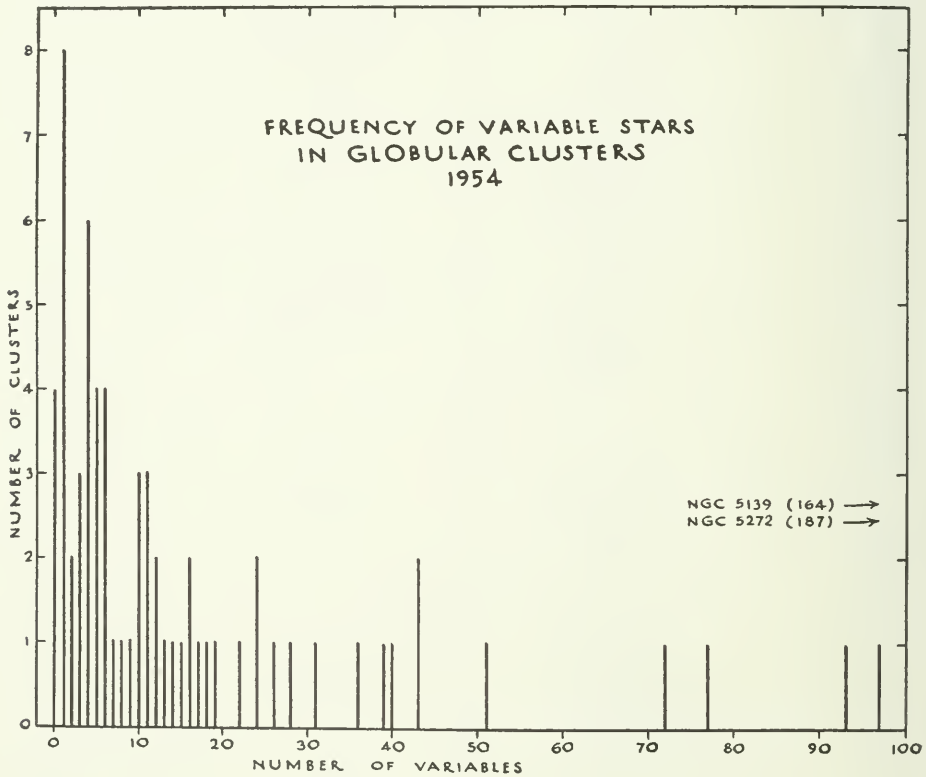

FIGURE 1. Distribution of the known, published variables per cluster for 68 clusters.

cluster, giving the numbers of clusters which have the number of variables indicated by the abscissa. More than 50 per cent of the clusters examined, 37 in all, have 10 variables or less. On the other hand, 18 clusters, about 25 per cent, have more than 20 variables. It is not possible to say at present how the observed frequency of variables in these clusters will compare with the true frequency; we might comment, however, that there have been very few cases in which, once a globular cluster had been searched for variables, further work changed it from a variable-poor to a variable-rich category. That is to say, additional hunting for variables increases the numbers in a moderate rather than a radical way.

This actual frequency of variables in globular clusters is interesting because it is at variance with common impressions that variable stars abound in globular clusters. Of the 72 clusters now examined, only 7 contain more than 50 variables each; and probably few, if any, clusters will be added in the future to this list of variable-rich objects. Since most of the clusters left to be studied are small and difficult, they will almost certainly increase the number with few variables. Three-quarters of the clusters examined contain less than 20 variables. It is rather surprising to note that the most frequent number of variables found in a globular cluster is one!

The richest cluster still remains NGC 5272, Messier 3, with 187 variables and 2 suspected. A close second is Omega Centauri, NGC 5139, with 164. Next in order of richness are Messier 5 (NGC 5904) and Messier 15 (NGC 7078), with about half as many variables, 97 and 93 respectively.

NUMBER OF KNOWN PERIODS

Of the known variables, periods have now been determined for 843 in 38 clusters, compared with 656 in only 20 clusters in 1939. Hence though the studies of the past fifteen years have not enormously increased the number of known variables or new periods, they have brought us a better over-all picture of the variable content of the entire system of globular clusters than we had earlier when the four rich clusters cast their weight too heavily.

Of the periods now listed, 274 are new, in 30 clusters. For a number of clusters there have been revisions and redeterminations of periods. For statistical purposes I have counted the period as new only if the value was changed by more than 0.01 day.

DISTRIBUTION OF PERIODS AND TYPES

There are 779 definite RR Lyrae periods known in 28 clusters. In addition there appear to be at least 335 more stars which are probably of this character. Probably also most of the 185 stars for which the data do not permit a definite assignment of type will also prove to be of this class.

Attention has often been drawn to the difference in frequency of period from one cluster to another. It is interesting, however, to portray the frequency

of all known RR Lyrae periods in globular clusters. This is shown in figure 2 for period intervals of 0.01 day. The outstanding feature of the distribution is the conspicuous gap in periods slightly under 0.45 day. It is difficult to think that this gap is caused by any observational selection (unless some factor causes stars of this period to have a very small range). There certainly would appear to be no reason why periods of this length are more difficult to determine. The double maximum in this distribution of period frequency raises the question as to whether we are concerned with two different types of stars. Are RR Lyrae variables whose periods are shorter than 0.45 day the same kind of variable as those whose periods are longer? Numerous studies of the RR Lyrae stars in the galactic system, for example by Kukarkin, Struve and Joy, and Shapley suggest that all RR Lyrae stars do not constitute a homogeneous group.

Nearly 10 per cent of the known variables in globular clusters are definitely not RR Lyrae stars, 122 stars in 36 clusters. Table III, which is similar to Table II in the first catalogue, lists these 122 stars which are within the visible limits of globular clusters and are not RR Lyrae variables. The table in the present catalogue is considerably more inclusive than the earlier one, which was restricted to stars with known periods over a day. The present table includes the W Ursae Majoris types such as Var. 141 in NGC 5272, stars with irregular light variation, and stars of unknown type which are listed as probably not RR Lyrae stars. Many of these stars are field variables, and not cluster members. Any definite information in this regard has been listed, but in most cases more observational evidence is necessary to decide whether a variable is an actual cluster member.

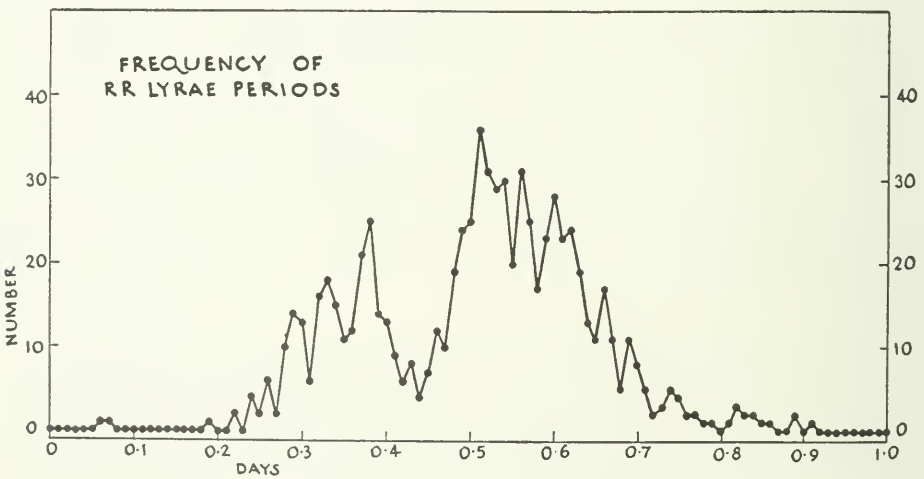

FIGURE 2. Numbers of RR Lyrae periods at intervals of 0.01 day for 781 periods in 28 globular clusters.

TABLE III

VARIABLES WHICH ARE NOT RR LYRAE STARS

NGC	No.	Magnitudes Max.	Min.	Period (days)	Remarks
104	1	11.3	[16.0	212.40	long per.
	2	11.55	15.3	202.84	long per.
	3	11.35	16.1	192.34	long per.
	4	12.0	14.0		cycles 150±
	5	13.0	14.0		irreg.
	7	13.3	13.8		irreg.
	8	12.7	14.7		cycles 150±
	10	13.1	13.6		irreg.
	12	13.2	14.0		irreg.
288	1	13.5	14.1	103.	semireg.
362	2	13.0	14.5	105.22	prob. Small Cloud
	8	14.8	16.3	3.901447	prob. Small Cloud
	10	14.7	16.2	4.20519	prob. Small Cloud
1904	2	14.2	14.8		irreg. or semireg.
2419	1	17.59	18.32		bright irreg.
	8	17.50	18.10		bright irreg.
	10	17.31	17.93		bright irreg.
	18	17.84	18.53		bright irreg.
	20	17.65	18.16		bright irreg.
3201	65	14.01	15.03	1.6599990	eclipsing
	68				red, prob. long per.
4590	27*	10.88	15.04		FI Hya, field, long per.
4833	2	13.0	16.2	333.7	RZ Mus, long per.
	9	14.5	15.16	87.7 or 1	HV 10781
	10	15.14	15.9		Cepheid, HV 10782
	11	14.5	16.0:	303.8	long per., HV 10783
5024	24	15.71	16.43	3?	type unknown
5139	1	10.7	12.6	58.7027	RV Tauri type
	2	]13.06	16.12	484.	per. poss. 242^d
	6	13.84	15.24		irreg.
	17	14.18	14.61	60:	irreg.
	29	12.44	13.50	14.72429	Cepheid
	42	12.5	14.9	149.4	
	43	13.41	14.55	1.1568183	Cepheid
	48	13.09	13.95	4.474293	Cepheid
	53	13.30	13.87	87:	irreg.
	60	13.32	14.48	1.349464	Cepheid
	61	13.72	14.48	2.27358	Cepheid
	78	14.17	14.84	1.1681179	eclipsing
	92	14.10	14.58	1.3450659	Cepheid
	129	14.18	14.74		irreg., long per.?
	133	13.74	14.53	0.31709628	W UMa type, field
	138	12.5	13.6	74.6:	irreg.
	148	12.9	13.8	90:	irreg.
	152	12.8	13.7	124:	irreg.

TABLE III (*cont.*)

NGC	No.	Magnitudes Max.	Min.	Period (days)	Remarks
	161	13.3	13.8		irreg.
	162	12.9	13.6		irreg.
	164	13.7	14.0		irreg., prob. red
5272	95*	13.31	14.50	103.19	semireg.
	141	14.88	15.65	0.2695477	RV CVn, W UMa type
	154*	11.86	13.5	15.2828	W Vir type
5904	42*	10.76	12.46	25.738	Cepheid
	50*	13.6	14.0	106?	irreg. or semireg.
	84*	11.00	12.77	26.5	Cepheid
	101	17.16			SS Cyg type
6093	1*	13.1	14.5	15.70	W Vir type
	6	9.3	15.8	177.13	S Sco; prob. field
	7	9.5	15.5	222.53	R Sco; prob. field
	Nova	6.8			Nova T Sco 1860
6121	4*	11.0	13.0	65±	semireg.
	13*	12.37	13.08		semireg.
6171	1	]14.16	[16.75		prob. long per.
6205	1*	13.27	14.61	1.45899	Cepheid
	2*	12.67	13.90	5.11003	Cepheid
	6*	13.90	14.73	2.11283	Cepheid
	10*	13.4	13.7		semireg.
	11*	12.92	13.71	92.5	semireg.
	15	13.32	13.67		irreg.
6218	1*	11.9	13.2	15.508	W Vir type
6229	8	15.30	16.64		Cepheid
	22	15.2	16.3		prob. slow
6254	1*	12.8	13.2		semireg.
	2*	11.91	13.34	18.754	W Vir type
	3	13.10	13.82	7.87	Cepheid
6273	2	13.4	14.7		Cepheid?
6341	14	14.8	15.1	0.346178	W UMa type, field
6397	1	11.2	16.0	314.6	long per., poss. field
	2	13.8	14.8	45 or 60	semireg., poss. field
6402	1*	14.3	16.0	18.75	W Vir type
	2*	15.4	16.3	2.7952	Cepheid
	7*	14.9	16.2	13.59	W Vir type
	17*	14.8	15.7		field? type unknown
6522	7	17.02	17.61		irreg., field
6541	1	12.5	[16		prob. long per.
6553	Nova	7.5			Nova Sgr 1943
	4			]100	
	5			]100	
6626	2	14.3	14.8		poss. slow
	3	14.6	15.4		poss. slow
	4*	13.6	14.8	14.0	W Vir type
	6	14.3	15.2		per. many weeks
	10	13.5	14.6		slow

TABLE III *(cont.)*

NGC	No.	Magnitudes Max.	Min.	Period (days)	Remarks
6656	5*	12.0	12.8		slow
	8*	12.0	12.7		semireg.
	9*	12.7	13.3		semireg.
	11*	12.9	13.8	1.69050	Cepheid
	14*	13.8	[15.5	200.2	long per., field
	17	14.6	[15.		prob. irreg.
6712	2	14.0	14.9	105	AP Sct; RV Tau type?
	7	14.2	[17.0		prob. long per.
6715	8	16.8	17.6		poss. not RR Lyr
	12	16.7	17.3		poss. not RR Lyr
	19	16?	16.5		poss. not RR Lyr
	25	16.8	17.4		poss. not RR Lyr
6779	1*	15.2	16.3	1.510019	Cepheid
	3*	14.4	15.1		semireg.
	5	14.4	15.2	43±	semireg.
	6*	12.9	14.8	90.02	RV Tau type
	7	15.6	16.3	40–50	semireg.
	8	15.9	16.7	68±	semireg.
	9	15.6	16.1		semireg.
6838	1	13.5	14.9		slow, Z Sge
	2	13.8	14.7		slow
	3	15.2	17.0		eclipsing
7006	19			252:	long per.
7078	1*	14.39	15.75	1.437478	Cepheid
	86	13.4	14.6		prob. Cepheid
7089	1*	13.29	14.78	15.5647	W Vir type
	5*	13.30	14.47	17.5548	W Vir type
	6*	13.07	14.31	19.3010	W Vir type
	11*	12.12	13.25	67.086	RV Tau type
7099	4	16.4	[18	11–15	U Gem type

*Spectrum available.

Almost all types of variable stars are represented. Table III lists 2 novae, 15 Cepheids with periods up to 10 days, 13 stars with periods from 10 to 26 days, either Cepheids or W Virginis stars, 18 long period variables, 3 eclipsing variables, 3 W Ursae Majoris, 2 SS Cygni, and 4 RV Tauri stars, as well as 39 irregular and semi-regular variables of several kinds. The remainder are of indefinite type. No flare stars or R Coronae Borealis variables have been noted as yet.

Description of the Catalogue

The catalogue contains every cluster for which there is a published record of a search for variables, and a few others for which the unpublished data have been supplied to the writer. The clusters are arranged in order of NGC

number, or, lacking that, by right ascension. If the cluster has a Messier number, it is given. The right ascension and declination are for the equinox of 1950.

The variables are numbered according to the number given by the discoverer except in a few cases where an adjustment has had to be made. The x and y co-ordinates are given in seconds of arc and correspond in direction to right ascension and declination. Whenever they have been published, magnitudes, epochs, and periods are given. A blank in these columns indicates lack of published data. When an observer has given a table of maximum and minimum magnitudes, these have been taken. However, in many cases the writer has had to read these values from published measures of many plates by taking the brightest and faintest estimates of magnitude for the variable. Epoch of maximum gives the number of days past J.D. 2,400,000.000. For stars in clusters like Omega Centauri and Messier 3 where many investigations of small period changes have been made, only one value (usually the latest or best determined) is given for the period.

Suspected variables have not been included in the catalogue in general, except for those where numbers had been previously assigned. Announced variables which are now considered not to vary have been left in the catalogue so that a reader may be aware of them, but they have not been included in the totals of known variables.

In an attempt to clear up some of the confusion which has existed for years in Messier 3, NGC 5272, the writer has identified the variables whenever possible in von Zeipel's catalogue. A similar process has been followed for Messier 15, NGC 7078, with Küstner's catalogue, since Rosino published some of these identifications for his new variables in that cluster.

When necessary, notes pertaining to a cluster are given after the data on that cluster.

References to Literature on Variable Stars in Globular Clusters

To the catalogue is appended a complete bibliography of literature on variable stars in globular clusters. The 125 references given in the 1939 catalogue have now been expanded to 193, including 6 references before 1939 found after the publication of that list. This total does not include references to unpublished correspondence, which contains much vital information. As formerly, the references are arranged by years, and alphabetically under author for any given year. At the end of each cluster, the list of numbers indicates the references to that cluster, and special note is made of the references in which photographs or charts of the clusters giving identification of the variables can be found.

Acknowledgments

In the preparation of this catalogue I have had a great deal of co-operation

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Richmond Hill, Ontario
September 30, 1954

SECOND CATALOGUE OF VARIABLE STARS IN GLOBULAR CLUSTERS

NGC 104 (47 Tucanae) α 00^h 21^m.9, δ −72° 21′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	+ 36.8	−112.6	11.3	[16.0	12717.	212.40	
2	+ 64.7	−193.9	11.55	15.3	12685.	202.84	
3	+ 328.4	+ 52.8	11.35	16.1	12755.	192.34	
4	− 18.8	−160.4	12.0	14.0		150±	cycles
5	+ 271.9	−284.6	13.0	14.0			irreg.
6	+ 97.3	−103.8	13.2	13.8	var?		
7	+ 349.2	−113.0	13.3	13.8			irreg.
8	+ 16.0	+ 57.0	12.7	14.7		150±	cycles
9	− 108	− 78	13.5	14.5		short	HV 810
10	+ 72	+702	13.1	13.6		irreg.	HV 811
11	+ 306	+138	13.2	14.0		irreg.	HV 813
12	+1254	−348	13.6	14.4		short	HV 814

A suspected variable, HV 812, is not listed above.
Refs. 9, 14, 20, 68, 139, 173, 175. Plate in 20.

NGC 288 α 00^h 50^m.2, δ −26° 52′

1	− 55	+ 79	13.5	14.1	25576	103	

2 unpublished variables?
Refs. 87, 150 with chart.

NGC 362 α 01^h 01^m.6, δ −71° 07′ (Corrected position)

1	− 246.2	− 67.6	14.9	16.1	23751.558	0.5850512	
2	+ 41.4	−204.4	13.0	14.5	24391.8	105.22	HV 206
3	+ 93.6	−143.2	14.6	16.1	23604.806	0.4744151	
4	− 50.2	− 27.3	14.0	15.8			
5	− 79.2	− 31.9	15.1	16.4	24025.729	0.4900846	
6	+ 82.4	+ 15.5	14.9	16.3	24461.642	0.5146080	
7	+ 131.1	− 21.2	14.8	16.0	24468.687	0.5285492	
8	+ 33.4	−308.5	15.0	16.5	24433.677	3.901447	HV 212
9	− 400.4	+224.4	14.7	16.0	24404.670	0.5476126	
10	+ 282.8	−381.8	14.9	16.4	23315.643	4.20519	HV 214
11	− 136.1	− 26.0	15.1	16.0			
12	− 30.4	−115.4	15.2	16.1	24391.839	0.65254518	
13	+ 14.5	+ 38.8	14.6	16.3			
14	− 23.8	− 66.8	14.8	16.2			

Refs. 11, 14, 20, 90, 94, F, J. Plate in 20, 94.

CATALOGUE—*Continued*

NGC 1851 α 05^h $12^m.4$, δ $-40°$ 05′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	+ 261	− 9	14	$15\frac{1}{2}$			
2	− 45	+ 30	14	$15\frac{1}{2}$			

1 unpublished variable.
Refs. 72, 87. No map.

NGC 1904 (Messier 79) α 05^h $22^m.2$, δ $-24°$ 34′

1	+ 29.6	−199.6	var.?				med. 16.0
2	+ 78.3	− 68.3	14.2	14.80			semireg.
3	+ 34.8	− 64.4	15.9	16.7	34032.40	0.73602	
4	+ 93.4	− 50.1	15.6	16.7	32877.50	0.63492	
5	− 11.6	+ 20.2					
6	− 70.8	+115.6	16.0	16.6	32940.25	0.33522	

Refs. 14, 20, 181. Plates in 20, 181.

NGC 2298 α 06^h $47^m.2$, δ $-35°$ 57′

6 unpublished variables, 5 suspected.
Ref. F.

NGC 2419 α 07^h $34^m.8$, δ $+39°$ 00′

1	+ 40	− 52	17.59	18.32			irreg.
2	− 4	− 19					
3	+ 52	− 24	18.66	19.96			
4	+ 80	− 15	18.84	19.65			
5	+ 33	+ 47	18.75	19.72			
6	+ 56	−127	18.86	19.64			
7	+ 91	+ 87	18.69	19.77			
8	− 17	+ 41	17.50	18.10			irreg.
9	− 32	+ 88	18.59	19.76			
10	+ 20	− 51	17.31	17.93			irreg.
11	+ 95	− 8	18.55	19.81			
12	+ 133	+111	18.69	19.71			
13	+ 101	− 10	18.55	19.75			
14	− 115	− 13	18.81	19.62			
15	+ 62	+ 40	18.62	19.76			
16	+ 47	+ 72	18.77	19.85			
17	+ 109	+111	18.65	19.75			
18	− 15	+114	17.84	18.53			irreg.
19	− 107	− 40	18.77	19.86			
20	− 28	+ 45	17.65	18.16			irreg.

CATALOGUE—*Continued*

NGC 2419

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
21	− 55	+ 30	18.76	19.74			
22	+ 109	− 5	18.60	19.84			
23	+ 27	+ 79					
24	− 147	− 10	18.94	19.58			
25	− 59	+ 38	18.78	19.70			
26	− 70	− 50					
27	+ 19	−103	19.10	19.55			
28	− 192	+ 59	18.72	19.78			
29	− 58	− 7	19.01	19.92			
30	− 26	+ 23					
31	+ 154	−146	19.08	19.53			
32	− 19	+ 48	18.60	19.71			
33	+ 47	− 17	19.11	20.13			
34	+ 21	+157	19.00	19.66			
35	+ 43	+ 8	18.88	20.00			
36	+ 23	+ 44	19.10	19.83			

Ref. 108, with plate, I.

NGC 2808 α 09^h 10^m.9, δ −64° 39′
4 unpublished variables, 7 suspected.
Refs. F, N.

NGC 3201 α 10^h 15^m.5, δ −46° 09′

1	+ 59	−118	14.71	15.76	22484.504	0.6048761
2	+ 29	−117	14.61	15.60	28272.352	0.5326722
3	+ 182	− 43	14.90	15.49	22100.533	0.5994093
4	+ 155	+ 3	14.76	15.60	23198.539	0.6300006
5	+ 42	− 24	14.63	15.75	23172.676	0.5015359
6	− 116	−143	14.50	15.55	23166.545	0.5256131
7	− 91	−189	14.87	15.35	23566.533	0.6303322
8	− 69	− 99	15.00	15.46	23166.613	0.6286280
9	− 51	− 91	14.86	15.57	23506.605	0.5266970
10	− 181	+235	14.66	15.59	22429.597	0.5351571
11	− 104	+112	14.87	15.40	29696.446	0.2990471
12	− 86	+108	14.50	15.53	23547.577	0.4955583
13	− 160	+ 92	14.57	15.50	23163.664	0.5752145
14	− 156	+133	14.61	15.67	23961.495	0.5092897
15	− 279	−173	14.34	15.43	23164.572	0.5346644
16	− 197	−238				
17	+ 11	− 25	14.84	15.80	28253.276	0.5655773
18	+ 23	− 24				
19	+ 23	+317	14.54	15.45	29696.361	0.5250201
20	+ 39	+284	14.45	15.55	29273.322	0.5291064

CATALOGUE—*Continued*

NGC 3201

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
21	+ 94	+135	14.75	15.62	23191.514	0.5666509	
22	− 100	− 56	14.72	15.45	23165.679	0.6059842	
23	− 49	− 50					
24	− 339	+ 17	14.76	15.35	23166.521	0.5889798	
25	+ 93	+173	14.68	15.53	23566.533	0.5147963	
26	+ 219	−140	14.80	15.61	23198.542	0.5689949	
27	+ 58	−323	14.11	15.32	23164.508	0.4842943	
28	+ 66	− 48	14.98	15.74	23932.478	0.5786766	
29	− 256	+113					
30	− 289	+272	14.56	15.36	23166.488	0.5158559	
31	+ 182	+131	14.65	15.51	23505.620	0.5194894	
32	+ 195	+199	14.55	15.56	23190.624	0.5611656	
33	+ 48	− 40	not var.				
34	+ 296	+285	14.37	15.62	23547.577	0.4678883	
35	− 11	+121	14.90	15.45	22484.504	0.6155244	
36	− 108	− 11				0.484	
37	− 68	− 74					
38	− 61	− 60	14.70	15.60	23877.612	0.5091616	
39	+ 41	+ 54	14.83	15.80	23181.537	0.4832092	
40	− 96	+ 68					
41	+ 291	+ 28					
42	− 301	+197	14.39	15.44	27565.286	0.5382490	
43	− 377	+ 15	14.80	15.39	23166.665	0.6761289	
44	+ 31	+ 67	15.01	15.66	23190.635	0.6107344	
45	+ 127	− 32	14.85	15.60	23165.684	0.5374165	
46	− 396	−510	14.56	15.35	23167.570	0.5431990	
47	+ 108	+245					
48	− 252	+ 12					
49	− 38	+151	14.74	15.43	23172.499	0.5814870	
50	− 13	+ 27					
51	− 205	− 26	14.37	15.50	28273.328	0.5205454	
52	+ 14	−812					
53	− 873	−758	14.57	15.38	23191.540	0.5334705	
54	+ 671	−804	14.67	15.44	23548.660	0.5558721	
55	− 338	+767					
56	+ 246	+ 94	14.95	15.62	23164.591	0.5903376	
57	+ 288	− 72	14.80	15.58	28628.317	0.5934373	
58	+ 346	− 80	14.94	15.45	23164.538	0.6220418	
59	− 490	− 70	14.32	15.40	23528.608	0.5177106	
60	− 850	+ 95	14.22	15.47	23165.526	0.5035723	
61	−1125	+175					
62	−1060	−186	14.62	15.28	23506.538	0.5697558	
63	−1000	+ 59	14.36	15.39	23914.582	0.5680998	
64	− 646	+863	14.40	15.36	23191.538	0.5224218	
65	− 544	+797	14.01	15.03	26417.421	1.6599990	ecl.
66	− 398	+289	not var.				

CATALOGUE—*Continued*

NGC 3201

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
67	− 374	−120					
68	− 283	+846					long per.
69	− 221	+995	14.34	15.50	23914.575	0.5122704	
70	− 221	− 13	not var.				
71	− 182	−117	14.65	15.46	23506.605	0.6011859	
72	− 161	+596	not var.				
73	− 128	+86	14.39	15.60	23172.569	0.5199500	
74	− 94	+ 36	not var.				
75	− 81	+147	not var.				
76	− 62	− 42				0.526	
77	− 10	− 52	14.67	15.40	22429.592	0.5676648	
78	− 8	−143					
79	+ 10	−101	not var.				
80	+ 60	+ 23					
81	+ 96	−153					
82	+ 161	−166	not var.				
83	+ 177	+172	14.58	15.67	23190.624	0.5451918	
84	+ 358	+703	14.65	15.43	22077.566	0.5136787	
85	+ 569	−403	not var.				
86	+ 611	−315	not var.				
87	+1013	−460	14.65	15.30	23164.633	0.6038866	

Unpublished epochs and magnitudes, ref. Q.
Refs. 46, 59, 127, 140 with print.

NGC 4147 α 12^h 07^m.6, δ +18° 49′

1	− 100.1	− 45.7	15.90	16.95	25324.68	0.4993
2	− 20.2	− 28.8	15.95	17.25	25305.541	0.4920
3	− 28.5	− 35.3	16.32	16.78	25321.528	0.3834
4	+ 1	+ 18	16.5	17.1		

Refs. 36, 85, 89. Print in 85.

NGC 4372 α 12^h 23^m.0, δ −72° 24′

3 unpublished variables, 11 suspected. Ref. N.

NGC 4590 (Messier 68) α 12^h 36^m.8, δ −26° 29′

1	− 280	+109	15.55	16.11	34067.792	0.349599
2	− 168	− 45	15.05	16.29	33663.695	0.5781805
3	− 140	+ 91	15.40	16.15	33661.66	0.4128?
4	− 117	−131	15.65	16.20		0.2864?
5	− 56	+170	15.47	16.11	33741.570	0.3878

CATALOGUE—*Continued*

NGC 4590

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
6	− 54	+ 17	15.75	16.07	33741.542	0.269261	
7	− 50	− 79	15.71	16.07	34093.461	0.279294	
8	− 38	−134	15.69	16.08	34093.509	0.280560	
9	− 31	+ 40	15.43	16.28			
10	− 25	− 16	15.28	16.62			
11	− 18	−112	15.65	16.16	33741.541	0.369499	
12	− 10	− 1	15.07	16.23			
13	− 6	− 56	15.72	16.11	34149.415	0.265638	
14	− 4	+218	15.02	16.25	33663.714	0.5567753	
15	+ 9	+ 58	15.65	16.36			
16	+ 11	+ 80	15.65	16.22	34071.536	0.418330	
17	+ 16	− 75	15.65	16.60			
18	+ 19	− 96	15.69	16.19	33741.46	0.367345	
19	+ 33	+ 70	15.65	16.20			
20	+ 34	−114	15.69	16.14	34118.451	0.385763	
21	+ 48	+ 8	15.82	16.60			
22	+ 61	− 22	15.30	16.52			
23	+ 64	+380	14.85	16.13	34506.392	0.658898	
24	+ 74	− 8	15.64	16.13	34093.522	0.376495	
25	+ 141	+123	15.01	16.15	33770.450	0.6415354	
26	+ 158	− 44	15.63	16.11	33799.370	0.413217	
27	+ 380	+263	10.88	15.04		long	Sp., field
28	+ 440	+160	14.81	16.18	34120.498	0.6067773	
29	+ 287	−252	15.65	16.15			
30	+ 112	− 78	15.70	16.15			
31	− 109	+ 90	15.49	16.10	33741.461	0.399658	

Variables Nos. 29, 30, 31 are unpublished, found by Rosino, ref. L.
Refs. 44, 49, 117a, 159, 186, L. Print in 49.

NGC 4833 α 12^h $56^m.0$, δ $-70°$ 36′

1	− 264	+468	15.32	15.86	29375.251	0.750101	RY Mus
2	+ 378	−354	13.0	16.2:	26166	333.7	RZ Mus
3	0	+ 6	15.46	15.9	29363.248	0.744526	HV 10775
4	0	+ 24	15.24	15.88	29381.249	0.655536	HV 10776
5	+ 132	− 66	15.4	16.0	29381.240	0.629414	HV 10777
6	+ 120	+120	15.3	15.9	29381.297	0.653967	HV 10778
7	+ 72	− 6	15.49	16.05:	29374.256	0.668422	HV 10779
8	− 168	+498	15.59	15.79	var?		HV 10780
9	− 42	− 6	14.5	15.16	28635	87.7:	HV 10781
10	+ 72	+414	15.14	15.9			HV 10782
11	− 336	−828	14.5	16.0:	24320	303.8	HV 10783

Refs. 65, 87, 149.

CATALOGUE—*Continued*

NGC 5024 (Messier 53) α 13^h 10^m.5, δ +18° 26′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	+ 9.6	−171.0	16.05	16.95	22789.486	0.6098214	
2	− 78.0	−183.6	16.38	16.88	22787.498	0.3861005	
3	− 60.6	−138.0	16.14	16.93	22763.412	0.6306111	
4	− 169.5	−156.6	16.41	16.84	23113.482	0.3851668	per. var.
5	− 237.0	−258.0	15.89	16.98	22790.515	0.6394274	
6	+ 123.6	+ 13.5	16.08	17.11	22790.620	0.6640168	
7	+ 79.5	+ 83.5	16.02	16.95	22763.515	0.5448337	
8	+ 72.0	+ 60.0	16.28	16.95	22762.584	0.615531	
9	+ 67.5	− 40.5	16.03	17.10	22789.484	0.6003729	
10	− 138.6	+ 54.0	15.90	16.98	22789.443	0.6082560	
11	− 143.4	− 58.5	16.04	16.82	22762.647	0.6299539	
12	+ 409.5	+187.5	16.05	16.91	22789.497	0.6125863	
13	+ 462.0	−299.7	15.87	17.03	22789.533	0.6274465	
14	+ 354.6	−207.0	15.88	17.00	22790.490	0.5454024	
15	+ 248.4	+228.0	16.39	16.67	23113.458	0.308724	
16	− 136.5	−202.5	16.43	16.90	22790.520	0.3031707	
17	− 214.5	+114.0	16.29	16.80	22762.612	0.3814992	
18	− 96.0	+ 12.6	15.83	16.42			
19	+ 165.6	− 42.0	16.34	16.85	22789.465	0.3918418	
20	+ 188.4	−351.6	16.32	16.81	23113.615	0.3844312	per. var.
21	+ 437.4	− 27.0	16.32	16.81	22790.410	0.3384650	
22	− 53.4	−288.0	16.56	16.85	var?		
23	+ 96.0	− 89.7	16.34	16.88	23113.460	0.3658077	per. var.
24	− 118.5	− 29.2	15.71	16.43		3.?	
25	+ 130.3	+ 31.7	16.16	16.90	22787.552	0.7051762	
26	− 288.0	−279.9	16.29	16.74	22789.485	0.3911185	
27	− 203.8	−157.9	16.16	16.93	22790.376	0.6710576	
28	− 181.4	+459.0	15.78	16.94	22790.500	0.6327877	
29	+ 125.4	− 79.5	16.56	17.04	22808.33	0.823239	
30	+ 57.7	−482.8	16.18	17.04	22790.47	0.5354938	
31	+ 60.6	− 0.1					
32	− 111.9	− 86.6	16.26	16.65	22790.475	0.3901324	
33	− 165.0	+ 12.2	16.58	17.14			
34	− 144.0	−216.7	16.48	16.70	not var.		
35	+ 104.1	+153.2	16.38	16.88	22789.480	0.3726736	
36	+ 120.3	+306.5	16.33	16.71	23113.698	0.3732511	per. var.
37	− 44.0	+ 62.2	15.68	16.48			
38	+ 21.3	−143.2	16.08	16.81	22789.483	0.7057825	
39	− 234.0	+212.5	16.84	17.26	not var.		
40	+ 8.9	+111.5	16.55	16.89	26418.664	0.3148076	
41	+ 19	+ 66					
42	− 67	+ 17	15.54	16.33			
43	− 34	+ 53					
44	+ 53	− 2	15.20	15.99			
45	− 5	− 36					
46	− 12	+ 34					

Refs. 51, 58, 79, 92, 97, 132, 160. Prints in 51, 92, 160.

CATALOGUE—*Continued*

NGC 5053 α 13^h 13^m.9, δ +17° 57′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	− 380	+158	15.80	16.60	30519.640	0.647178	
2	− 193	− 3	16.00	16.50	30556.611	0.378953	
3	+ 140	+138	15.90	16.55	30519.640	0.592946	
4	+ 31	−114	15.75	16.55	31969.580	0.667061	
5	+ 220	−220	15.90	16.45	29786.690	0.714861	
6	+ 126	+ 77	16.00	16.45	30555.617	0.292199	
7	− 87	+169	16.05	16.40	30880.610	0.351581	
8	+ 117	+ 50	16.05	16.55	31203.460	0.362842	
9	− 199	+382	15.95	16.55	31911.500	0.741741	
10	+ 94	+ 56	16.10	16.45	30883.640	0.437397	

Refs. 83, 158, 168. Prints in 83, 168.

NGC 5139 (ω Centauri) α 13^h 23^m.8, δ −47° 13′ (corrected position)

1	− 416.16	+298.89	10.7	12.6		58.7027	
2	− 340.00	+238.51	]13.06	16.12		484.	
3	− 507.93	+167.43	14.19	15.11	26524.245	0.8412205	
4	− 337.61	+262.10	13.89	15.18	26473.374	0.6273172	
5	− 282.75	+328.29	14.06	15.34	26460.409	0.5152828	
6	− 162.43	+252.95	13.84	15.24		irr.	
7	+ 153.19	+879.15	13.98	15.11	26470.425	0.7130181	
8	+ 629.43	+ 16.20	13.90	15.29	26472.238	0.5212846	
9	− 473.17	+137.14	14.35	15.32	26453.421	0.5233358†	
10	− 397.76	+244.48	14.38	14.90	26524.241	0.374950	
11	− 158.63	+338.73	14.3	15.0	irr.	0.56481	
12	− 193.16	+274.34	14.43	14.95	26469.446	0.3867486	
13	− 487.26	+199.54	13.98	15.12	26438.457	0.6690480	
14	− 473.51	−627.56	14.40	15.01	26472.456	0.3771799	
15	− 194.09	+242.62	14.13	14.98	26469.427	0.8106198	
16	+ 517.05	−536.81	14.38	14.95	26435.488	0.3301694	
17	+ 522.24	+200.00	14.18	14.61		60:	irr.
18	+ 596.64	+220.15	13.89	15.18	26454.408	0.6216682	
19	+ 444.14	+ 32.44	14.68	15.22	26434.540	0.2995533	
20	+ 280.88	+ 32.06	14.01	15.20	26469.388	0.6155547†	
21	− 355.75	+162.07	14.20	14.81	26469.257	0.3808180	
22	+ 552.18	−330.22	14.43	14.97	irr.	0.39609	
23	+ 2.54	+240.71	14.26	15.39	26470.392	0.5108651	
24	+ 524.71	−336.96	14.41	14.88	26468.520	0.4622108	
25	− 210.77	+ 17.48	13.98	15.07	26469.433	0.5885005	
26	− 229.58	+101.21	14.36	15.06	26459.469	0.7847199†	
27	− 205.47	+ 24.11	14.50	15.19	26471.386	0.6156764	
28			not var.				
29	− 193.25	− 6.45	12.44	13.50	26465.88	14.72429	
30	− 307.92	− 75.01	14.40	14.86	irr.	0.40448†	
31			not var.				
32	+ 174.39	+420.01	13.87	15.20	26469.421	0.6204317	

CATALOGUE—*Continued*

NGC 5139

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
33	− 554.54	− 24.00	13.88	15.24	26461.436	0.6023262	
34	− 396.87	−269.04	14.18	15.13	26471.369	0.7339450	
35	+ 71.70	+365.07	14.37	14.94	26468.484	0.3868382	
36	+ 246.11	+789.42	14.38	14.93	irr.	0.37984†	
37			not var.				
38	+ 169.10	−470.37	14.36	15.11	26469.456	0.7790480	
39	+ 741.86	−365.80	14.33	14.99	26469.474	0.3933567	
40	− 220.99	−125.30	13.95	15.15	26471.364	0.6340969†	
41	+ 151.80	−142.18	14.03	15.06	26523.185	0.6629590	
42	+ 0.21	− 50.21	12.5	14.9		149.4	
43	− 119.23	+103.16	13.41	14.55	26470.385	1.1568183	
44	− 243.40	−354.05	14.24	15.36	26466.380	0.5675440	
45	− 764.48	+ 80.97	13.94	15.19	26473.404	0.5891259	
46	− 770.61	+170.11	14.03	15.17	26454.471	0.6869382	
47	− 504.32	+269.26	14.27	14.73	irr.	0.48517†	
48	− 86.54	−104.54	13.09	13.95	26523.70	4.474293	
49	− 391.98	−553.77	14.16	15.28	26470.407	0.6046505	
50	− 530.75	+ 65.40	14.57	15.10	26472.336	0.3861815	
51	− 36.85	+258.73	13.86	15.16	26441.448	0.5741359	
52	− 112.85	+ 36.47	13.60	14.22	26461.348	0.6603737	
53	− 482.79	−447.74	13.30	13.87		87:	irr.
54	− 229.39	+592.76	14.22	15.05	26472.412	0.7728973	
55	− 617.73	−816.68	14.38	15.39	26471.323	0.5816930	
56	− 515.93	−541.96	14.37	15.38	26428.437	0.5680030	
57	+ 635.72	−493.26	14.31	15.06	26471.342	0.7944118	
58	− 335.44	+277.68	14.49	14.74	26524.233	0.3699057	
59	− 282.90	− 65.84	14.20	15.18	26523.231	0.5185176†	
60	− 108.42	−247.33	13.32	14.48	26473.513	1.349464	
61	+ 280.44	+ 68.07	13.72	14.48	26468.345	2.273582	
62	− 199.80	+ 45.28	13.88	15.10	26424.515	0.6197937	
63	− 996.82	−491.46	14.47	15.04	26438.567	0.8259507	
64	− 448.01	−457.49	14.45	15.02	26466.410	0.3444512	
65	− 454.49	−474.32	14.77	15.22	26523.238	0.06272282	
66	− 133.37	+375.15	14.46	14.95	irr.	0.40745†	
67	− 178.11	+593.57	14.18	15.28	26470.377	0.5644551	
68	− 338.18	+545.12	14.15	14.67	26469.366	0.5344773	
69	− 965.76	−530.94	14.10	15.25	26438.468	0.6532165	
70	+ 417.83	−304.65	14.45	14.94	26524.219	0.3906091	
71	+ 220.39	+ 47.13	14.38	14.92	26523.271	0.3574826	
72	+ 477.85	+734.87	14.42	14.94	26471.459	0.3845163	
73	− 532.49	+750.76	13.87	15.18	26472.358	0.5752184	
74	+ 215.47	+664.83	13.75	15.24	26454.399	0.5032505	
75	+ 341.44	+591.55	14.42	14.87	26456.501	0.4222508	
76	+ 113.31	+511.81	14.40	14.82	26523.135	0.3378438	

CATALOGUE—*Continued*

NGC 5139

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
77	+ 352.29	+392.42	14.45	14.93	irr.	0.42593†	
78	+ 586.10	+146.68	14.17	14.84	27943.307	1.1681179	
79	+1000.12	− 51.02	13.97	15.27	26456.423	0.6082747	
80	+1304:	−108:	14.1:	14.8		0.45 or 0.31	
81	+ 511.36	+228.72	14.46	14.98	26523.110	0.3894022	
82	+ 499.94	+126.98	14.43	14.96	26463.452	0.3358520	
83	+ 226.09	+424.66	14.43	15.00	26471.427	0.3566071	
84	−1202.81	− 74.70	14.09	14.90	26472.382	0.5798722	
85	−1010.51	+307.98	14.23	15.09	26523.243	0.7427555	
86	+ 293.14	+147.26	13.96	15.18	26470.383	0.6478442	
87	+ 113.68	+184.13	14.40	14.90	26454.448	0.3965019	
88	+ 98.13	+203.28	14.01	14.81	26523.273	0.6901992	
89	− 2.95	+159.29	14.47	14.97	26523.329	0.3748505	
90	− 5.30	+137.09	13.81	14.73	26460.432	0.6034020	
91	+ 43.72	+144.35	14.25	14.91	26459.480	0.8951422	
92	− 317.86	+446.38	14.10	14.58	26473.345	1.3450659	
93			not var.				
94	− 504.09	+355.09	14.64	14.95	26463.416	0.2539318	
95	− 824.80	− 11.05	14.49	14.98	26473.448	0.4049213	
96	− 71.20	+ 97.06	13.93	14.82	26455.467	0.6245312	
97	+ 225.50	+187.93	14.11	15.16	26523.234	0.6918869	
98	+ 198.25	+102.38	14.57	15.09	26524.265	0.2805657	
99	+ 160.35	+ 50.36	13.77	14.90	26472.390	0.7660839	
100	+ 179.49	+ 65.68	14.05	15.05	26434.489	0.5527119	
101	+ 444.11	− 73.28	14.50	14.94	26523.291	0.3408843	
102	+ 361.83	− 94.10	14.16	15.22	26468.445	0.6913841	
103	+ 283.14	+ 2.35	14.46	14.80	26456.354	0.3288461	
104	+ 822.98	−309.01	14.54	14.95	26471.370	0.8678506	
105	+ 603.23	−246.92	14.57	15.12	26524.300	0.3353375	
106	+ 130.35	+ 26.92	13.88	15.02	26523.189	0.5699074	
107	+ 279.83	−139.13	14.07	15.39	26466.424	0.5141010	
108	+ 185.66	− 46.36	13.84	14.81	26472.360	0.5944533	
109	+ 153.91	− 57.13	13.99	15.03	26469.395	0.7440653	
110	+ 158.94	− 87.08	14.41	14.96	26524.256	0.3221021	
111	+ 27.26	− 0.30	14.18	14.80	26438.498	0.7628923	
112	+ 79.83	−103.36	13.92	14.92	26470.380	0.4743558	
113	+ 99.99	−187.65	13.94	15.22	26523.244	0.5733636	
114	+ 38.08	−101.15	14.00	14.75	26470.416	0.6753065	
115	− 345.49	−336.14	14.03	15.21	26467.406	0.6304590	
116	− 109.66	+ 33.71	14.12	14.77	26472.437	0.7201327	
117	− 267.73	− 40.22	14.40	14.92	26456.506	0.4216653	
118	− 58.87	− 98.67	13.88	15.02	26473.380	0.6116200	
119	− 82.04	−157.45	14.51	14.83	26472.319	0.3058774	
120	− 211.29	−247.61	14.26	15.23	26523.264	0.5485722	
121	− 184.36	−189.58	14.48	14.81	26524.259	0.3041814	

CATALOGUE—*Continued*

NGC 5139

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
122	− 162.92	−261.41	13.99	15.17	26437.512	0.6349307†	
123	+ 46.11	−512.55	14.41	14.90	26473.331	0.4739051	
124	+ 78.88	−626.81	14.37	14.97	26524.107	0.3318614	
125	+ 23.74	−742.59	13.87	15.29	26471.408	0.5928902	
126	+ 822.95	−730.44	14.45	14.97	26453.493	0.3418933	
127	− 880.16	+ 4.31	14.54	14.92	26524.177	0.3052752	
128	− 289.77	− 92.09	14.25	14.86	26469.401	0.8349748	
129	+ 192.02	− 25.83	14.18	14.74			irr.?
130	− 366.17	+900.99	14.30	15.40	irr.	0.4932377	
131	− 165.05	− 59.95	14.40	14.86	26523.329	0.3921392	
132	− 72.44	− 29.31	13.97	14.96	26469.386	0.6556410	
133	−1914.22	+1053.78	13.74	14.53	26473.334	0.31709628	W UMa
134	− 942.87	+972.72	13.93	15.20	26466.386	0.6529039	
135	− 184.88	− 37.25	13.87	14.85	26470.314	0.6325795	
136	− 154.26	+ 60.08	14.22	14.64	26472.409	0.3919136	
137	− 149.54	+ 96.23	14.38	14.90	26473.286	0.3342134	
138	− 111.12	−187.55	12.5	13.6		74.6	irr.
139	− 86.94	+ 65.18	14.00	14.90	26462.404	0.6768666	
140	− 42.65	− 86.80				short	
141	− 55.47	− 47.46	14.05	14.75	irr.	0.6975651	
142	− 37.35	− 2.56	14.2	14.8		short	
143	− 37.45	+ 71.40	14.24	14.77	26470.394	0.8207020	
144	− 33.28	+ 22.44	14.33	14.81	26454.329	0.8353054	
145	+ 49.07	−148.51	14.40	14.87	irr.	0.37315†	
146	+ 65.96	− 48.03	13.87	14.77	26469.386	0.6331021	
147	+ 298.70	−151.04	14.35	14.80	26473.333	0.4226945	
148	+ 299.20	+ 44.21	12.9	13.8		90:	irr.
149	+ 477.33	+894.18	13.92	15.13	26523.256	0.6827332	
150	+ 543.18	−442.23	14.07	14.94	26462.387	0.8991585	
151	+1010.06	+753.35	14.42	14.84	26523.333	0.4077805	
152	+ 13.84	− 48.83	12.8	13.7		124:	irr.
153	+ 34.46	+136.32	14.48	14.88	26524.176	0.3864509	
154	+ 169.59	−113.20	14.55	14.72	26524.165	0.3223311	
155	+ 75.25	+237.31	14.43	14.88	26473.344	0.4139117	
156	+ 15.06	−191.94	14.41	14.83	26468.432	0.3591887	
157	+ 1.77	+ 82.58	14.42	14.79	26523.370	0.4064970	
158	− 10.58	−119.80	14.32	14.74	26472.442	0.3673350	
159	−2039.94	−891.45	14.39	14.96	27565.332	0.3431150	
160	− 711.13	+969.21	14.46	14.98	26473.439	0.3972932	
161	− 96.81	−129.27	13.3	13.8		irr.	
162	− 392.40	−252.39	12.9	13.6		irr.	
163	− 575.24	+499.91	14.51	14.78	26472.451	0.3132294	
164	+ 152.75	+478.38	13.7	14.0		irr.	prob. red
165	− 69.92	+104.59					

CATALOGUE—*Continued*

NGC 5139

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
166	− 2.89	+144.71					
167	− 352.63	−321.43					
168	− 543.66	−201.42	14.96	15.46		0.3212933	

So many of the RR Lyrae variables in this cluster have been shown to be variable in period or form of light curve that this information cannot be included in the table. For further particulars see especially Martin, ref. 118, and Wright, ref. 136.

†Two periods given by Martin.

Variables Nos. 28, 31, 37, 93 are said by Bailey to be not variable.

Epochs of maximum from ref. D.

Refs. 14, 17, 20, 31, 40, 62, 67, 90, 99, 113, 116, 118, 119, 129, 131, 136, 143, 162, 165. Plates in 20 and 118.

NGC 5272 (Messier 3) α 13^h 39^m.9, δ +28° 38′

1	− 5.2	−128.5	14.80	16.14	15021.378	0.5206324	765
2	+ 15.8	+ 52.6					894
3	+ 57.9	− 66.0	14.91	16.16	15021.225	0.558207	none
4	− 43.5	− 8.8	14.9	16.0			559
5	+ 261.0	− 22.3	14.76	16.09	15021.239	0.505894	1357
6	− 123.9	+ 60.1	14.75	16.19	15021.452	0.5143207	361
7	− 4.8	+ 87.2	14.69	16.25	15021.064	0.4974290	775
8	− 81.7	− 23.4	not var.				437
9	− 291.4	−207.8	14.84	16.22	15021.111	0.5415672	226
10	+ 153.6	+138.0	15.03	16.17	15021.270	0.5695127	1291
11	− 152.6	−209.7	14.89	16.22	15021.131	0.5078919	321
12	− 3.8	−145.4	15.35	15.98	15021.015	0.3178890	776
13	− 26.0	−137.5	15.08	16.14	15021.323	0.4830535	644
14	− 49.0	−161.0	15.01	16.10	15021.179	0.6358993	537
15	− 90.8	−273.2	14.83	16.24	15021.299	0.5300771	411
16	− 301.4	− 93.1	14.73	16.24	15021.418	0.5115072	221
17	+ 142.4	−440.4	15.24	16.37	15021.265	0.5761344	none
18	+ 97.6	−295.3	15.08	16.34	15021.142	0.5163462	1202
19	+ 350.5	−245.6	15.64	16.20		0.631981	1388
20	+ 333.5	−271.6	14.74	16.13	15021.289	0.4912607	1380
21	+ 346.9	+ 17.9	14.88	16.29	15021.171	0.5157298	1386
22	+ 190.2	− 10.7	14.83	16.25	15021.200	0.481466	1320
23	− 113.0	+279.2	14.79	15.70	15021.082	0.5953756	374
24	− 147.6	+ 10.4	15.07	16.09	15021.563	0.6633499	328
25	− 124.4	− 31.4	14.77	16.23	15021.089	0.480048	362
26	− 177.4	− 43.0	14.89	16.15	15021.239	0.5977479	296
27	− 110.2	−102.8	15.17	16.21	15021.566	0.5790981	379
28	− 25.0	−105.8	15.03	16.28	24290.335	0.470666	656
29	− 65.2	− 73.6					486
30	− 36.5	+ 58.0	14.88	16.19	22760.635	0.5120891	593

CATALOGUE—*Continued*

NGC 5272

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
31	+ 33.1	+ 65.1	14.73	16.25	15021.542	0.5807218	982
32	+ 11.8	+ 60.1	14.86	16.38	15021.108	0.4953526	867
33	+ 70.5	− 89.0	15.01	16.22	15021.217	0.5252255	1126
34	+ 135.4	+170.2	14.89	16.16	15021.136	0.5591078	1265
35	− 107.3	−278.2	15.04	16.24	15021.032	0.530608	384
36	+ 172.0	− 35.4	14.86	16.26	15021.272	0.5455861	1308
37	− 236.7	+164.7	15.14	16.02	15021.248	0.3266402	253
38	− 203.0	+127.7	15.06	16.26	24290.304	0.5580326	279
39	− 243.6	+121.4	15.07	16.17	15021.073	0.5870732	249
40	− 271.2	+112.4	14.93	16.18	15021.609	0.5515419	234
41	− 93.3	+ 54.0	15.04	16.21	15021.441	0.4850291	407
42	− 78.6	+ 41.0	14.85	16.27	15021.515	0.5902069	445
43	+ 99.9	+ 24.7	14.86	16.23	15021.191	0.5405023	1207
44	+ 170.0	+ 99.4	14.75	16.21	15021.368	0.506443	1307
45	− 241.2	−129.9	14.93	16.30	15021.349	0.5368966	252
46	− 128.1	− 51.5	15.46	16.24	15021.264	0.613367	355
47	− 117.5	− 73.2	14.98	16.20	15021.459	0.5410201	366
48	+ 126.9	−102.7	15.16	15.99	15021.088	0.6278087	1253
49	+ 140.0	−100.7	15.19	16.23	15021.266	0.5482222	1268
50	+ 8.8	−234.0	15.15	16.09	15021.327	0.513088	840
51	+ 30.8	−226.4	15.08	16.21	15021.486	0.5839856	965
52	− 76.8	+152.0	14.99	16.16	15021.485	0.516189	451
53	− 7.4	+122.8	14.70	16.13	15021.006	0.5048891	759
54	− 32.6	+106.4	14.94	16.22	15021.193	0.506493	616
55	− 204.2	+324.4	14.85	16.21	15021.699	0.5298114	278
56	− 141.1	+358.6	15.20	15.94	22760.623	0.3295969	338
57	+ 155.2	− 0.2	14.97	16.22	15021.618	0.5122311	1292
58	− 86.2	+ 46.2	14.78	16.16	22760.621	0.517101	425
59	− 109.8	−228.4	15.22	16.24	15021.332	0.5888026	378
60	− 297.4	−315.4	15.20	16.14	15021.389	0.7077216	222
61	+ 190.2	+363.0	14.88	16.20	15021.076	0.5209367	1321
62	+ 90.2	+417.0	15.21	16.10	15021.331	0.6524063	1187
63	+ 37.2	+341.9	14.93	16.14	15021.094	0.5704204	999
64	+ 114.8	+330.4	15.05	16.10	15021.324	0.6054592	1234
65	+ 125.4	+327.5	14.74	16.09	15021.503	0.6683397	1250
66	− 101.4	+121.4	15.20	16.01	15021.323	0.6201973	396
67	− 131.4	+123.0	15.21	16.12	15021.411	0.5683681	351
68	+ 21.9	+174.8	14.8	16.3		0.355974	922
69	+ 80.6	+141.0	15.09	16.18	15021.553	0.5665806	1164
70	+ 37.6	+152.2	15.12	15.70	15021.315	0.486064	1003
71	+ 160.6	− 2.0	15.12	16.20	15021.168	0.5490517	1298
72	+ 445.5	− 2.2	14.61	16.37	15021.327	0.4560721	1409
73	+ 438.5	+ 62.2	15.0	16.0			1406
74	+ 88.2	+151.0	14.87	16.26	15021.452	0.4921415	1181
75	+ 49.0	+159.5	15.23	15.99	15021.411	0.3140813	1057
76	− 14.4	− 88.2	14.72	16.41	15021.293	0.5017529	710
77	− 94.4	+ 27.8	14.85	16.36	15021.451	0.4593422	404

CATALOGUE—*Continued*

NGC 5272

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
78	+ 47.5	+ 66.4	15.10	16.13	15021.249	0.6119228	1051
79	+ 43.4	+349.4	14.81	16.24	15021.229	0.4832979	1041
80	+ 416.8	+284.6	15.05	16.27	15021.433	0.5385169	1400
81	+ 342.8	+351.1	14.67	16.28	15021.325	0.5291108	1384
82	− 102.6	−601.8	14.92	16.27	15021.527	0.5245027	391
83	− 441.6	+113.4	14.66	16.25	15021.046	0.5012423	181
84	+ 64.0	+165.2	15.20	16.14	15021.248	0.5957289	1105
85	+ 306.2	+225.8	15.00	15.83	22760.517	0.355820	1373
86	+ 513.0	−114.2	15.31	16.13	15021.016	0.2926615	1422
87	+ 110.6	+ 60.2	15.31	15.91	22760.535	0.357480	1222
88	− 35.0	− 70.2	14.9	16.0	24290.324	0.298519	597
89	+ 28.0	−110.8	14.86	16.15	15021.507	0.5484778	948
90	+ 97.2	−188.2	14.80	16.24	15021.461	0.5170344	1201
91	− 14.3	−550.0	15.05	16.27	15021.259	0.5301710	713
92	− 29.0	−408.4	14.88	16.23	15021.083	0.5035579	623
93	− 319.4	−396.6	15.30	16.22	15021.177	0.6023041	214
94	− 488.4	−224.6	14.84	16.21	15021.118	0.5236921	173
95	− 154.7	+ 15.4	13.73	14.42		103.19	318
96	− 164.2	−234.0	14.78	16.13	15021.019	0.4994538	305
97	− 130.0	−196.7	15.53	16.01	15021.524	0.334927	353
98	+ 132.4	− 3.2	not var.				1259
99	+ 201.8	− 55.0	14.8	15.8			1330
100	+ 69.9	+ 97.3	15.3	16.2		0.618813	1122
101	+ 46.4	+ 83.7	15.50	16.14	15021.101	0.643900	1048
102	+ 58.4	+114.9	15.2	15.9	variable?		1090
103	+ 58.1	+120.4	not var.				none
104	− 25.8	+145.5	14.74	16.09	15021.288	0.5699246	650
105	− 20.9	+191.6	15.17	15.66	15021.315	0.2877445	679
106	− 48.0	+168.0	15.17	16.20	15021.310	0.5471636	541
107	− 75.8	+335.0	15.02	15.99	15021.443	0.3090344	455
108	− 219.0	+310.9	14.77	16.21	15021.083	0.5196047	264
109	− 89.3	+ 2.7	14.86	16.31	15021.033	0.5339259	416
110	− 99.4	− 15.8	15.02	16.24	15021.397	0.5353700	397
111	− 92.7	+ 21.9	14.96	16.18	15021.402	0.5101921	409
112	− 144.6	−719.4	not var.				333
113	+ 199.8	−689.8	14.90	16.43	15021.241	0.5130031	1328
114	+ 11.8	+622.0	15.08	16.24	15021.515	0.5977254	873
115	+ 445.0	+664.7	14.69	16.25	15021.297	0.5133533	1410
116	− 491.8	+465.2	14.80	16.22	15021.441	0.5148090	170
117	+ 89.6	−467.6	15.26	16.23	15021.579	0.6005122	1184
118	+ 144.4	−292.2	14.73	16.28	15021.272	0.4993795	1277
119	+ 253.4	+106.2	14.73	16.16	15021.460	0.5177510	1353
120	− 295.8	+231.4	15.36	16.05	15021.284	0.6401377	223
121	− 43.6	+ 56.1	15.41	16.25	22760.550	0.5351935	561
122	− 33.5	− 46.4	14.6	16.1		0.5017	608
123	− 259.	−985.	15.16	16.75	15021.395	0.5454416	244
124	− 66.4	−201.4	15.3	16.2		0.752438	479

CATALOGUE—*Continued*

NGC 5272

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
125	+ 186.3	−132.8	15.41	16.08	15021.029	0.3498210	1317
126	− 15.4	−146.4	15.50	16.03	15021.208	0.3484044	700
127	+ 95.6	− 63.6	not var.				1198
128	+ 114.6	+131.4	15.07	15.97		0.2922661	1231
129	− 43.6	+ 77.2	15.2	16.1		0.305471	560
130	+ 4.2	+ 84.6	15.10	16.13	22760.347	0.5688389	818
131	− 73.2	+ 27.4	15.18	15.94	15021.318	0.2976902	459
132	− 53.6	− 22.0	15.3	16.4	24290.387	0.3398479	524
133	− 58.6	+ 43.5	14.89	15.96	15021.482	0.5507230	503
134	− 22.4	+ 52.4	14.9	16.3	24290.282	0.6190	669
135	− 27.0	+ 38.0	15.0	16.5		0.56843	636
136	− 25.4	+ 33.4	15.6	16.2			643
137	+ 53.0	− 18.8	14.9	16.2	15021.155	0.575146	1072
138	− 263.6	+ 41.9	not var.				238
139	+ 34.5	+ 28.0	15.25	16.12	22760.465	0.560004	985
140	− 15.7	+108.9	15.10	15.88	22760.216	0.3331259	708
141	−1497.5	−249.9	14.9	16.4		0.2695477	48
142	− 30	− 59	15.6	16.6	24290.397	0.568627	620
143	− 34	+ 16	15.4	16.4	24290.337	0.51111	604
144	+ 54	−100	14.8	16.7	24290.565	0.59674	
145	+ 29	+ 8	14.9	16.5	24290.528	0.514456	944?
146	+ 96	− 59	14.6	16.5	24290.563	0.596740	1193?
147	− 21	+ 46	15.1	16.3	24290.005	0.34644	671
148	− 7	+ 37	15.3	16.4	24290.170	0.467246	755
149	+ 34	+ 52	14.7	16.5	24290.228	0.54985	
150	+ 69	+ 37	14.8	16.7	24290.359	0.52397	1119
151	+ 4	− 40	14.9	16.3	24290.191	0.51705	
152	+ 77	+ 50	15.0	16.3	24290.355	0.32641	1151?
153	− 38	+ 60	not var.				585
154	+ 2	− 29	12.9	14.0	24647:	15.7677	801
155	− 64	− 74					486
156	− 21	− 42	not var.				678
157	− 17	+ 35	14.2	15.7	24647.650:	0.5283	698
158	− 16	− 41	15.2	16.5	24647.564:	0.50809?	703
159	− 15	+ 16	14.9	16.6	24647.602:	0.5337	714
160	− 9	− 44	14.9	16.1	24647.446	0.64792	742
161	+ 17	− 58	15.4	16.4	24647.567:	0.49874	901
162	+ 28	− 32	not var.				950
163	− 16	− 32	not var.				702
164	+ 21	− 36	15.3	15.9			909
165	+ 73	+ 20	14.7	16.5	24647.544	0.483638	
166	− 97	− 8	15.1	16.2			402
167	− 78	− 37	15.4	16.5	24647.448	0.69245	447
168	− 45	+ 7	14.9	16.0	24647.617	0.3770	553
169	− 29	− 35	not var.				627

CATALOGUE—*Continued*

NGC 5272

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
170	− 28	+ 32	15.1	16.1	24647.716:	0.43725	633
171	− 27	+ 16	15.0	16.1	24647.864	0.4303	638
172	− 21	+ 25	14.9	16.5	24647.700	0.59400	677
173	− 13	+ 39	15.2	16.6	24647.670:	0.606990	
174	− 9	− 34	15.1	16.1	24647.710	0.4082	743
175	+ 42	+ 26	14.9	16.2	24647.914	0.60780	
176	+ 46	+ 32	14.8	16.4	24647.621	0.55599	
177	+ 63	− 29	15.0	16.3	24647.953	0.34835	1102
178	+ 79	+ 46	15.2	16.5	24647.755	0.26499	1153
179	+ 39	−774	not var.				
180	− 19	− 27	not var.				676?
181	− 30	− 14	not var.				
182	− 19	+ 60	not var.				
183	+ 29	+ 7	not var.				944?
184	− 25	− 14	14.9	16.4	24647.841	0.517	645?
185	− 15	+ 32	15.2	16.1			705?
186	+ 12	− 64	15.1	16.1	24647.670	0.675	
187	− 23	+ 9	14.9	16.2	24647.961	0.3927	
188	− 27	+ 24	15.0	16.0	24647.615:	0.3677	641?
189	− 25	− 21	15.2	16.0	24647.964	0.668	654
190	− 8	+ 28	14.8	16.5	24647.936	0.501	749
191	0	+ 24	15.1	16.1	24647.981	0.512	802
192	− 2	+ 3	15.0	16.1	24647.933:	0.525	783
193	+ 15	− 7	14.8	16.3	24647.777	0.630	881
194	+ 17	− 13	15.1	16.4	24647.758	0.549	892
195	− 13	− 29	15.0	16.2	24647.470:	0.600	720
196	+ 47	+ 1					1052
197	+ 58	+ 10	15.1	16.5	24647.689	0.500075	1092
198	− 23	+ 15	15.2	16.0	24647.923:	0.3617	666
199	− 19	+ 13	14.8	16.3	24647.699:	0.488	
200	− 4	+ 21					769
201	+ 4	− 9					none
202	− 379.7	+101	15.4	15.8			190
203	− 30.2	−308	15.56	15.72		0.28719	632
204	− 106.4	− 18	15.76	15.90		0.9170	390

Refs. 1, 8, 10, 11, 14, 17, 19, 20, 22, 25, 28, 31, 32, 38, 40, 43, 45, 50, 55, 56, 60a, 61, 76, 80a, 84, 86, 98, 101, 105, 109, 110, 111, 115, 130, 135, 141, 144, 165, 179, M. Plates in 20, 25.

Sandage and Roberts (ref. M) strongly suspect v.Z. 329 is variable with small amplitude, 0.15, and hope other observers will try to corroborate this.

Just as for NGC 5139, most of the variables have been shown to have period changes, see especially Martin, ref. 144 and Hett, ref. 141. These cannot be included in the table. The value given for the period is usually from the latest work on the star.

The data for this cluster have been combined from many sources as follows: Positions: Nos. 1–137 Bailey, 138–141 Larink, 142–183 Müller, 184–199 Greenstein, 200–201 Shapley. Magnitudes from Greenstein. Epochs: 1–153 from Müller, 154–199 Greenstein, data on No. 202 from Schwarzschild, Nos. 203 and 204 from Sandage, with von Zeipel's positions.

CATALOGUE—*Continued*

NGC 5272

In a further attempt to clear up some of the confusion of identification of the variables in this cluster (discussed in detail in the last catalogue), I have identified as far as possible the variables with the numbers in von Zeipel's catalogue (*Ann. l'Obs. Imp. Paris, Mém.*, v. 25, F 1–101, 1908). In cases where the variable is definitely not in the catalogue, this is indicated by "none" in the number column. Where no satisfactory identification has been made, a blank is left; and the number is questioned if doubt exists.

There is doubt as to whether vars. 145 and 183 correspond to v.Z. 944 or 961. Shapley's Variable 18 is definitely v.Z. 944; but it is not certain whether his Var. 18 is the same as either 145 or 183.

NGC 5286 α 13^h $43^m.0$, δ $-51°$ 07′

No variables found. Ref. 71. No map.

NGC 5466 α 14^h $03^m.2$, δ $+28°$ 46′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	+858	− 95	15.6	16.7	30553.674	0.577415	
2	− 62	−110	15.5	16.6	30554.720	0.588523	64
3	− 31	− 8	15.4	16.7	30550.623	0.578065	95
4	− 80	+ 9	15.5	16.6	30556.602	0.337968	56
5	− 64	+112	15.7	16.7	30519.697	0.380519	61
6	+122	− 24	15.2	16.6	29786.653	0.62096	202
7	−210	−225	15.7	16.7	30519.697	0.703423	20
8	+ 23	− 6	15.8	16.7	30520.617	0.629120	141
9	+ 31	+ 15	15.5	16.7	30170.656	0.685027	148
10	+ 85	+ 46	15.8	16.7	30519.697	0.709273	186
11	+117	+ 68	15.7	16.7	30884.625	0.37799	198
12	+ 17	− 88	16.0	16.5	30880.665	0.2942387	134
13	− 49	− 73	16.0	16.7	30556.702	0.341557	83
14	− 47	+ 52	15.8	16.5	30880.599	0.440041	84
15	+223	+ 20	15.9	16.5	30519.618	0.28672	227
16	−149	−175	16.0	16.5	30553.612	0.29667	37
17	− 60	− 30	15.9	16.4	30519.713	0.370117	68
18	+ 44	+ 41	16.0	16.7	30519.697	0.37406	166

No. is from Hopmann's Catalogue, *A.N.*, v. 229, p. 209, 1927.
Refs. 78, 79, 157. Prints in 78, 157.

NGC 5634 α 14^h $27^m.0$, δ $-05°$ 45′

1	− 56.5	− 19.5	16.41	17.39		0.65872
2	− 25.4	+ 83.1	16.19	17.38		
3	− 45.1	+ 41.9	16.48	17.47		
4	+ 54.2	− 65.2	16.55	17.39		
5	− 11.6	−162.9	16.72:	17.19		
6	+ 43.4	− 52.6	16.69	17.05:		
7	− 0.4	− 4.0				

Ref. 156, with plate.

CATALOGUE—*Continued*

NGC 5694 α 14^h 36^m.7, δ −26° 19′

No variables found. Ref. 104. No map.

Baade's Cluster α 15^h 13^m.5, δ +0° 4′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	− 97	+ 25	16.80	17.55			
2	− 85	−246	16.90	17.60			
3	+143	−166	16.95	17.50			
4	+ 35	−238	16.90	17.60			
5	− 84	+ 94	17.05	17.50			

5 suspected variables.

Ref. 176 with print.

NGC 5897 α 15^h 14^m.5, δ −20° 50′

1	−109	−201	15.8	16.5		
2	− 57	− 97	15.8	16.4		
3	− 40	− 4	15.8	16.5		
4	+ 71	+ 20	15.5	15.9		

Ref. 187 with plate.

NGC 5904 (Messier 5) α 15^h 16^m.0, δ +02° 16′

1	+ 27.7	+161.1	14.31	15.41	27563.794	0.52178673
2	−343.5	− 31.5	14.74	15.60	27601.700	0.526
3	+160.1	+113.7	14.64	15.33	27567.842	0.60018398
4	− 12.3	+ 73.8	14.65	15.89	27627.708	0.44963886
5	− 7.8	+ 51.6	14.83	16.06	27567.929	0.545903
6	+ 27.2	− 46.6	14.55	15.61	27567.856	0.54883108
7	− 5.1	−191.3	14.42	15.57	27601.730	0.49439008
8	+134.0	−133.2	14.55	15.58	27605.697	0.54622519
9	+195.0	+ 88.0	14.68	15.50	27563.855	0.6988956
10	+107.4	+382.0	14.43	15.77	27567.825	0.53066335
11	−154.5	+ 84.5	14.43	15.58	27563.817	0.59589173
12	−175.5	− 17.3	14.40	15.73	27601.762	0.46771968
13	+ 11.0	− 65.4	14.75	15.64	27567.800	0.5131237
14	−145.6	+103.7	14.28:	15.34:	27567.974	0.4872433
15	+192.0	+ 3.6	14.84	15.32	27567.908	0.33676094
16	+ 91.0	+ 83.9	14.29	15.53	27567.781	0.64762455
17	− 26.1	+ 44.3	14.80	15.91	27567.723	0.601354
18	+151.7	−107.7	14.83	15.39	27567.773	0.464
19	+233.7	−129.9	14.11	15.68	27601.706	0.46995413
20	−255.5	− 25.0	14.50	15.29	27601.729	0.6094760
21	+322.6	+ 74.0	14.46	15.52	27605.684	0.6048946
22	−205.7	+383.5	not var.			
23	−253.4	− 10.9	not var.			

CATALOGUE—*Continued*

NGC 5904

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
24	− 46.8	− 71.7	14.77	15.65	27567.821	0.47837785	
25	− 28.9	−128.0	13.83	14.73	27567.766	short	
26	+ 21.8	+101.5	14.42	15.46	27601.761	0.6225647	
27	− 6.7	− 59.2	14.37	15.74	27888.894	0.4703	
28	+132.2	−121.1	14.50	15.68	27540.882	0.54394489	
29	−374.7	− 76.6	14.56	15.52	27567.700	0.4514	
30	+ 22.8	−212.8	14.80	15.49	27567.761	0.5921760	
31	+151.7	−141.7	14.79	15.36	27567.872	0.30058294	
32	+201.9	−150.6	13.98	15.50	27605.754	0.45778653	
33	− 21.1	+127.5	14.24	15.55	27601.738	0.50147264	
34	+ 84.3	+ 59.5	14.65	15.52	27567.727	0.56814350	
35	− 12.2	−114.7	14.68	15.16	27567.866	0.30811974	
36	− 8.4	− 52.2	14.96	15.91	27563.868	0.6277	
37	+ 44.7	− 67.0	14.49	15.60	27605.762	0.48879470	
38	− 44.2	+117.2	14.49	15.90	27889.937	0.47042783	
39	−125.3	−205.2	14.23	15.61	27563.832	0.5890352	
40	+124.8	+113.5	14.83	15.26	27605.698	0.31732857	
41	+ 19.3	+231.4	14.23	15.64	27567.879	0.48857528	
42	−123.2	−120.8	11.20	12.24	27567.8	25.738	Sp.
43	−201.8	+154.3	14.82	15.48	27601.767	0.6602275	
44	−102.5	+ 31.1	14.97	15.33	27601.732	0.247?	
45	−116.7	+ 65.7	14.74	15.90	27567.774	0.61663546	
46	− 80.0	+ 69.1	not var.				
47	− 75.3	+ 58.1	14.84	15.96	27563.861	0.5397300	
48	− 62.5	+106.3	not var.				
49	+ 52.7	+177.5	not var.				
50	+ 38.0	+109.1	14.00:	14.54:		irr.?	Sp.
51	+ 0.3	+135.5	var?				
52	+107.9	+ 35.3	14.49	15.57	27563.804	0.50178498	
53	+ 68.9	+ 19.2	14.98	15.28	27601.70	0.37360	
54	+ 30.3	+ 57.2	14.62	15.68	27567.721	0.45410915	
55	+ 80.1	−163.2	14.87	15.26	27601.734	0.32889680	
56	− 68.9	+ 96.5	14.75	15.86	27889.931	0.53469099	
57	− 30.6	+ 99.7	14.94	15.43	27567.897	0.28467869	
58	− 605.1	+168.2	14.63	15.65	27601.716	0.491266	
59	− 150.0	− 35.5	14.42	15.33	27540.936	0.54202572	
60	− 109.7	+ 8.2	15.04	15.74	27567.75	0.285218?	
61	− 254.9	− 31.4	14.63	15.60	27567.826	0.56861702	
62	+ 166.8	−216.8	14.73	15.40	27601.704	0.281409	
63	+ 212.9	+ 51.8	14.25	15.57	27567.851	0.49767716	
64	− 51.2	−248.9	14.54	15.64	27540.853	0.5445076	
65	− 159.9	− 93.8	14.28	15.60	27628.729	0.48065810	
66	+ 218.3	+406.8	14.81	15.36	27567.813	0.35068	
67	−1028.2	− 59.8	14.83	15.30	27567.733	0.349046	

CATALOGUE—*Continued*

NGC 5904

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
68	+ 897.5	+ 47.6	14.80	15.33	27628.727	0.3342771	
69	+ 653.3	+751.6	14.80	15.72	27567.761	0.49487432	
70	+ 393.8	+626.4	14.55	15.63	27567.930	0.5585282	
71	+ 664.1	+290.3	14.45	15.70	27541.011	0.5024681	
72	+ 689.7	+ 38.3	14.53	15.57	27596.82	0.562	
73	+ 17.3	+604.7	14.63	15.31	27601.753	0.34011278	
74	+ 202.8	+162.8	14.18	15.46	27626.684	0.45399611	
75	+ 78.6	−412.8	14.66	15.42	27596.816	0.6854141	
76	+ 80.5	−309.2	14.73	15.18	27563.813	0.4324211	
77	− 171.5	−184.8	14.68	15.42	27605.721	0.8451134	
78	+ 65.5	+159.7	14.86	15.28	27567.727	0.26481742	
79	− 133.5	− 32.2	14.95	15.51	27567.884	0.33313840	
80	− 48.6	+111.6	15.05	15.54	27562.986	0.33654242	
81	− 72.2	−121.7	14.62	15.54	27567.972	0.5573241	
82	− 67.8	+ 12.4	14.86	15.72	27563.798	0.5584455	
83	− 84.7	− 87.8	14.80	15.66	27567.783	0.5533080	
84	+ 43.7	− 31.9	11.54	12.61	27602	26.5	Sp.
85	+ 38.3	− 34.4	14.80	15.70	27567.970	0.52741	
86	+ 34.6	− 33.0	14.50	15.83	27567.856	0.56733	
87	+ 122.0	− 1.8	14.84	15.21	27540.914	0.7383875	
88	+ 65.2	+ 61.8	15.08	15.48	27563.832	0.32808270	
89	+ 60.0	+ 64.7	14.79	15.69	27626.707	0.55844189	
90	− 44.7	+ 15.3	14.67	15.88	27540.828	0.5571534	
91	− 36.0	+ 35.0	15.04	15.96	27567.927	0.584944	
92	− 56.6	−123.5	14.28	15.58	27567.963	0.46358	
93	+ 44.0	− 35.7	14.54	15.81	27567.771	0.55231	
94	− 23.5	+ 17.4	15.26	16.11	27601.728	0.53141	
95	− 47.2	+102.8	15.13	15.80	27626.689	0.29082	
96	− 12.4	+ 32.9	14.96	16.15	27563.778	0.51225	
97	+ 48.9	− 92.5	14.18	15.61	27601.754	0.54466	
98	+ 37.3	+ 20.0	15.26	15.71	27605.737	0.30639	
99	+ 34.4	− 0.1	15.32	15.89	27567.739	0.32134	
100	+ 2.8	+ 48.7	15.30	16.01	27628.710	0.29434	
101	− 281.6	+ 36.0	17.15				SS Cyg?
102	+ 14.8	− 14.8					prob. RR Lyr
103	+ 20.5	− 8.8					prob. RR Lyr

Epochs from ref. K, unpublished.

Refs. 2, 3, 4, 5, 6, 7, 11, 12, 14, 15, 17, 20, 24, 26, 31, 33, 40, 42, 53, 54, 60, 82, 137, 165, K. Plates in 20, 33, 137.

NGC 5986 α 15^h $42^m.8$, δ $-37°$ 37′

1 variable at a radial distance of 1′.7 from centre.

Refs. 14, 20. No map.

CATALOGUE—*Continued*

NGC 6093 (Messier 80) α 16^h $14^m.1$, δ $-22°$ 52′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	−137	+ 49	13.1	14.5	29406.8	15.70	Sp.
2	+ 22	− 19	14.7	15.3			
3	+104	+ 56	15.6	16.3			short per.
4	− 85	+ 61	15.6	16.2			short per.
5	+ 14	− 67	15.7	16.2			short per.
6	+520	+296	9.3	15.8	32036	177.13	S Sco
7	+502	+112	9.5	15.5	32142	222.53	R Sco
Nova	+ 4.0	+ 2.7	6.8		00551		T Sco

A suspected variable near this cluster is No. 101570 in Russian "Catalogue of Stars Probably Variable," 1951.

Refs. 20, 69, 122, 148, 165. Plates in 20, 148. Ref. 122 gives bibliography of nova.

NGC 6121 (Messier 4) α 16^h $20^m.6$, δ $-26°$ 24′

1	−281	+ 42	13.46	13.97	29706.315	0.288872	
2	−248	−195	13.05	14.10	29676.448	0.5356817	
3	−208	−507	12.92	14.08	29723.221	0.506651	
4	−185	−340	11.0	12.5		semireg.	Sp.
5	−185	− 93	13.57	13.99	29522.035	0.622401	
6	−115	+318	13.54	14.09	29705.377	0.320504	
7	−113	+231	12.99	14.28	29748.231	0.4987743	
8	−110	+111	12.88	14.22	29676.458	0.5081753	
9	−104	+105	12.75	14.16	29676.332	0.5718921	
10	− 68	+159	12.68	14.18	29717.391	0.4907161	
11	− 64	−297	13.32	14.14	29496.021	0.4930763	
12	− 53	−207	13.04	14.38	29676.323	0.4461309	
13	− 47	+270	12.37	13.08			Sp.
14	− 47	−244	12.96	14.40	29717.295	0.4635292	
15	− 32	+436	12.98	14.25	29496.035	0.4437854	
16	− 29	+ 69	13.05	14.18	29705.381	0.5425452	
17	− 8	+ 20	13.40	13.74	29708.319	0.855469	
18	+ 4	+ 27	12.84	14.20	29676.446	0.4787915	
19	+ 11	+358	12.76	14.18	29511.075	0.4678119	
20	+ 13	− 63	13.24	13.60	29676.381	0.3094164	
21	+ 19	− 4	12.73	14.10	29705.436	0.471986	
22	+ 34	+ 80	13.40	13.98	29676.410	0.6030634	
23	+ 38	− 26	13.26	13.77	29676.389	0.2985478	
24	+ 49	+ 48	13.12	14.06	29676.450	0.5467733	
25	+ 70	+ 70	13.08	14.08	29723.276	0.6127352	
26	+ 94	− 72	12.80	14.14	29538.993	0.5412200	
27	+ 118	+255	12.90	14.09	29723.260	0.6120184	
28	+ 259	+ 84	12.60	14.02	29676.411	0.522322	
29	+ 326	+598	12.88	14.02	29705.367	0.5224857	
30	+ 340	− 69	13.29	13.87	29676.458	0.2697501	
31	+ 353	+ 45	12.72	14.03	29676.272	0.5053135	

CATALOGUE—*Continued*

NGC 6121

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
32	+ 746	− 40	12.98	13.96	29705.446	0.579109	
33	+ 805	+630	12.70	13.96	29676.340	0.6148277	
34	− 820	+416	13.16	14.36	29723.338	0.554843	
35	− 377	+ 62	13.44	14.15	29705.441	0.627042	
36	− 208	−259	13.26	14.18	29676.370	0.541310	
37	− 39	+ 2	13.46	13.76	29522.064	0.247352	
38	− 23	− 92	13.38	14.09	29496.053	0.577848	
39	+ 1	− 80	13.62	14.06	29676.463	0.623980	
40	+ 25	+ 49				0.40151	
41	+ 65	−150	13.53	13.97	29676.402	0.2517311	
42	+ 377	+558	13.33	13.78	29526.164	0.303708	
43	+1263	+332	12.92	13.48	29748.245	0.320637	

Refs. 21, 90, 93, 126, 138, 145, 161, 165. Plates in 90, 126.

NGC 6144 α 16^h 24^m.2, δ −25° 56′

1	+481	−117	15.3	16.3			

Ref. 187.

NGC 6171 α 16^h 29^m.7, δ −12° 57′

1	− 112.8	−522.0	]14.16	[16.75		long per.
2	+ 148.8	−388.8	15.62	16.29		
3	− 224.4	−183.6	15.55	16.14		
4	− 99.6	−156.6	15.64	16.14		
5	+ 231.0	−161.4	15.74	16.21		
6	− 10.8	− 67.2	15.68	16.15		
7	+ 42.0	− 61.2	15.57	16.64		
8	+ 12.0	− 42.0	15.57	16.52		
9	− 26.4	− 19.8	15.91	16.33		
10	− 57.0	+ 8.4	15.48	16.65		
11	+ 9.6	+ 33.0	15.69	16.46		
12	+ 58.8	+ 61.2	15.27	16.48		
13	− 27.0	+ 72.0	15.45	16.59		
14	+ 17.4	+ 82.2	15.35	16.45		
15	+ 19.2	+120.0	15.57	16.12		
16	− 67.2	+113.4	15.69	16.51		
17	− 99.0	+ 71.4	15.35	16.45		
18	+ 77.4	+215.4	15.75	16.46		
19	+ 232.8	+162.6	15.77	16.25		
20	+ 31.2	+ 51.0	15.66	16.40		
21	+ 81.0	−144.6	16.33	16.78		
22	−1354.2	−183.0				
23	− 263.4	+ 19.2	15.61	16.13		
24	0.0	+ 8.4	15.66	16.46		

Ref. 121, with chart.

CATALOGUE—*Continued*

NGC 6205 (Messier 13) α 16^h 39^m.9, δ +36° 33′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	+ 73.06	− 24.86	13.2	15.0	27685.763	1.45899	816, Sp.
2	− 54.10	− 3.04	12.6	14.1	27308.868	5.11003	306, Sp.
3	−127.70	+ 16.52	15.58	15.79	prob. not var.		135
4	− 47.34	+ 58.18	15.04	15.23	prob. not var.		322
5	+ 71.62	− 14.06	14.33	14.94	24313.429	0.298?	806β
6	+ 92.68	+ 76.60	13.5	14.8	27274.867	2.11283	872, Sp.
7	− 39.78	− 82.72	14.72	15.17	24313.102	0.24?	344
8	− 93.02	+ 11.29	14.2	15.6	28038.654	0.750306	206
9	+ 71.62	− 14.06	14.0	15.1		short?	806α
10	− 5.40	− 70.73	13.1	14.0		semireg.	487, Sp.
11	− 45.78	− 75.88	12.9	13.8		92.5	324, Sp.
12	−105.88	+ 53.46	15.0	15.35	prob. not var.		187
13	− 45.37	− 31.30	14.26	14.50	prob. not var.		327
14	+ 3.18	+207.64	16.16	16.45	prob. not var.		527
15	+ 79.03	−115.34	13.32	13.67		irreg.	835

Var. No. 15 and period for No. 11, found by Arp, unpublished, ref. H. Numbers in right-hand column are identification in Ludendorff's Catalogue, *Potsdam Pub.*, v. 15, no. 50, 1905. Kollnig-Schattschneider's No. 5, for which the Ludendorff no. was erroneously given as 200, is the same as No. 8 above.

Variability of Nos. 3, 4, 12, 13, 14 questioned by Arp and Sawyer from unpublished material. Refs. 18, 20, 23, 27, 29, 30, 37, 40, 76, 133, 134, 142, 147, 165. Plates in 20, 134.

NGC 6218 (Messier 12) α 16^h 44^m.6, δ −01° 52′

1	+34	−62	11.9	13.2	27306.708	15.508	Sp.

Refs. 11, 102, 113, 123, 124, 165. Plate in 123.

NGC 6229 α 16^h 45^m.6, δ +47° 37′

1	− 24.6	−105.5	16.84	17.90			
2	− 71.9	+ 4.9	17.18	17.93			
3	−195.7	+ 41.3	17.21	17.82			
4	− 56.8	− 14.3	17.36:	17.89			
5	+ 14.5	+ 44.1	17.21	17.95			
6	+ 44.1	+ 41.5	17.28:	17.96			
7	− 41.7	− 49.9	16.84	18.01			
8	− 4.1	− 42.1	15.30	16.64			l.per. Cep.
9	− 38.9	+ 38.3	17.12:	17.91			
10	− 29.5	+ 72.7	17.28	17.99			
11	+ 23.9	− 25.0	]17.44	18.01			
12	+ 34.2	− 23.6	17.12	18.02			
13	+140.2	+ 61.3	17.15	18.01			
14	− 15.5	− 50.7	16.88	17.95			
15	+ 34.2	+ 27.5	17.39	17.92			

CATALOGUE—*Continued*

NGC 6229

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
16	+ 47.0	− 24.2	17.31	17.94			
17	− 96.3	− 75.0	17.08	17.72			
18	− 36.1	+ 32.2	17.34	18.00			
19	+ 53.4	− 44.4	16.96	18.00			
20	− 27.5	− 36.1	16.91	18.05			
21	+117.3	− 61.6	17.12	17.94			
22	+ 4	− 7	15.2	16.3			prob. slow

Note: Var. No. 1 in 1939 catalogue is now No. 8.
Refs. 36, 113, 156, 187. Plate in 156.

NGC 6235 α 16^h 50^m.4, δ −22° 06′

1	−16	+ 39	16.5	17.2			
2	+58	−211	16.5	17.3			

Ref. 187 with plate.

NGC 6254 (Messier 10) α 16^h 54^m.5, δ −04° 02′

1	+ 5	+ 22	13.2	13.8			Sp.
2	+ 30	+120	11.9	13.7	26607.712	18.754	Sp.
3	−209	+106	13.10	13.82		7.87	

Var. No. 3 found by Arp, unpublished, ref. H.
Refs. 14, 102, 113, 123, 124, 165. Plate in 123.

NGC 6266 (Messier 62) α 16^h 58^m.1, δ −30° 03′

1	+ 41.0	+ 6.1
2	− 26.6	− 68.9
3	− 89.2	− 5.8
4	− 94.6	− 39.6
5	−163.4	+123.4
6	− 81.2	+ 33.1
7	+ 22.6	+169.1
8	− 94.6	+163.4
9	− 92.7	+214.0
10	−452.7	+160.0
11	−456.2	+128.3
12	−203.4	+268.9
13	+ 1.6	+ 30.2
14	− 92.2	+264.7
15	+122.8	+303.0
16	− 74.8	+ 94.1

CATALOGUE—*Continued*

NGC 6266

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
17	− 21.4	+102.7					
18	− 33.4	+ 91.4					
19	− 15.3	+ 65.2					
20	+131.4	+159.8					
21	+105.4	+ 80.6					
22	+ 62.6	+ 12.6					
23	− 74.3	− 37.4					
24	+ 62.6	− 39.0					
25	+150.4	− 73.4					
26	−186.8	−302.1					

Refs. 14, 20 with plate.

NGC 6273 (Messier 19) α 16^h $59^m.5$, δ −26° 11′

1	+ 4	+ 48	14.1	15.1
2	+14	+123	13.4	14.7
3	−28	− 6	14.2	15.2
4	− 2	− 24	15.1	15.7

Ref. 152 with plate.

NGC 6284 α 17^h $01^m.5$, δ −24° 41′

1	− 24	+ 36	15.6	16.1
2	− 47	− 17	16.1	17.0
3	− 28	− 13	15.3	15.7
4	+ 22	− 18	15.4	16.3
5	+109	−205	16.4	17.0
6	+139	+221	15.9	16.4

Ref. 152 with plate.

NGC 6287 α 17^h $02^m.1$, δ −22° 38′

1	−152	−40	16.2	17.1
2	+ 46	−26	15.7	15.9
3	+ 26	+44	16.1	16.8

Ref. 152 with plate.

NGC 6293 α 17^h $07^m.1$, δ −26° 30′

1	+ 81.0	+49.5	15.9	16.6
2	−135.6	+64.5	15.8	16.7
3	+ 48.6	+18.6	15.5	15.8
4	+ 92	−81	16.1	17.1
5	+ 78	−83	15.7	16.5

Refs. 51, 152 with plate.

CATALOGUE—*Continued*

NGC 6333 (Messier 9) α 17^h 16^m.2, δ −18° 28′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	+ 91	− 76	15.6	16.9	29427.886	0.585727	
2	+ 40	− 31	15.6	16.4	29436.854	0.628191	
3	+207	−210	15.7	16.85	32000.735	0.605397	
4	+ 23	− 35	15.8	16.95	30520.749	0.670076	
5	+ 34	− 7	16.0	16.8	29435.870	0.274708	
6	− 70	− 14	15.7	16.95	29435.870	0.607795	
7	−111	− 80	15.95	17.2	29434.860	0.628456	
8	− 73	− 99	16.05	16.9			
9	+334	−191	16.0	16.75	30933.704	0.322990	
10	+ 37	+ 26	16.2	16.9	30553.653	0.242322	
11	− 4	− 7	15.7	16.8			
12	−275	−136	15.85	16.95	29408.951	0.571784	
13	+259	+ 11	16.7	17.8	30554.694	0.47985	

Ref. 32a, 87, 163, 177 with plate.

NGC 6341 (Messier 92) α 17^h 15^m.6, δ +43° 12′

1	+127.5	+ 41.3	14.64	15.53	27340.211	0.702807	
2	+ 91.2	+ 69.2	14.50	15.52	27340.329	0.643886	
3	+ 53.7	+252.7	14.58	15.70	27340.344	0.637494	
4	− 76.0	+ 58.0	14.52	15.43	27340.111	0.628911	
5	+ 81.6	− 53.7	14.50	15.51	27340.302	0.619707	
6	+ 38.7	+ 43.3	14.53	15.40	27340.360	0.600001	
7	+ 1.6	− 50.5	14.14	14.58	27340.373	0.515075	
8	+208.9	+208.0	14.70	15.79	27430.366	0.6735605	
9	+ 18.0	− 48.1	14.75	15.24	27340.218	0.61	
10	+ 83.0	+ 36.3	14.79	15.39	27340.283	0.377315	
11	+ 71.2	− 67.1	14.74	15.29	27430.301	0.3084416	
12	− 29.9	− 97.8	14.80	15.16	27340.009	0.4099586	
13	+153.4	− 60.1	14.93	15.08			
14	−316.0	+245.7	14.80	15.10	27340.089	0.346178	field, W UMa
15	+ 30	−102	14.6	15.2			
16	− 2	+ 77	14.0	14.5			

Of 2 other stars suspected by Nassau as variables, his No. 15 is considered non-variable, No. 16 is still suspect, ref. 184.

Refs. 64, 76, 114, 120, 125, 153, 184. Plates in 120, 184.

NGC 6356 α 17^h 20^m.7, δ −17° 46′

1	− 15	− 24	16.3	17.2
2	+101	−110	16.8	17.1
3	− 24	+ 45	16.0	[17.5
4	+187	+ 47	15.9	[17.5
5	−255	+152	15.7	[17.5

Ref. 187 with plate.

CATALOGUE—*Continued*

NGC 6362 α 17^h 26^m.6, δ −67° 01′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	00	00					
2	− 29	−100					
3	− 83	− 89					
4	− 79	− 88					
5	+ 81	− 14					
6	+ 54	+175					
7	+ 22	+104					
8	−263	+108					
9	−207	+138					
10	+186	+352					
11	− 28	+ 48					
12	−245	−104					
13	−234	−120					
14	+370	+ 28					
15	+ 51	+ 2					

2 unpublished variables.
Refs. 47, 87. No map.

NGC 6366 α 17^h 25^m.1, δ −05° 02′

1	− 26	− 42	15.5	17.0			
2	+305	−390	15.7	16.8			

Ref. 134, with plate.

NGC 6397 α 17^h 36^m.8, δ −53° 39′

1	+210.7	+448.4	11.2	16.0	13727.6	314.6	
2	−279.0	−424.6	13.8	14.8		45 or 60?	
3	−220.0	− 33.5	14.6	15.5	33119.320	0.330667	

Unpublished co-ordinates and magnitudes for No. 3 from Swope, ref. O.
Refs. 11, 20, 66, 90, 183. Plate in 20.

NGC 6402 (Messier 14) α 17^h 35^m.0, δ −03° 13′

1	+ 17	+ 47	14.3	16.0	18.75	Sp.
2	−116	−119	15.4	16.3	2.7952	Sp.
3	− 3	− 90	16.2	17.0		
4	+169	+ 73	16.3	17.5		
5	−136	+ 90	16.1	17.5		
6	+ 34	− 77	15.8	16.4		
7	+ 62	− 97	14.9	16.2	13.59	Sp.
8	+ 96	+ 35	16.6	17.7		
9	+151	− 39	16.3	17.5		
10	− 51	−205	16.3	17.4		

CATALOGUE—*Continued*

NGC 6402

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
11	+196	−223	16.0	17.3			
12	+224	−177	16.2	17.6			
13	− 29	−118	16.3	17.6			
14	+ 54	+ 1	16.2	17.5			
15	−135	+147	16.1	17.5			
16	− 79	− 36	16.2	17.4			
17	−228	+122	14.8	15.7			Sp., field?
18	+ 61	− 22	16.1	17.7			
19	−128	+ 2	16.3	17.6			
20	−145	+ 98	16.3	17.4			
21	+ 72	+125	16.3	17.4			
22	+ 70	+ 95	16.4	17.6			
23	+ 74	+281	15.9	17.4			
24	− 2	+ 75	16.1	17.6			
25	− 28	−312	16.4	17.5			
26	− 85	+ 27	16.5	17.5			
27	−421	+151	15.4	16.2			
28	−465	+372	15.0	16.0			
29	− 68	−152	15.7	16.2			
30	+ 76	− 12	16.2	17.5			
31	− 41	+ 32	16.0	17.0			
32	+ 36	+147	16.2	17.1			
33	−138	+ 12	16.2	17.3			
34	− 70	+ 26	16.4	17.6			
35	−112	− 49	16.2	17.4			
36	+204	−346	16.4	17.5			
37	+ 5	+ 18	16.4	17.7			
38	+ 11	− 17	16.0	17.0			
39	+ 46	− 2	16.1	17.6			
40	+253	+310	16.4	17.1			
41	− 13	− 3	16.0	17.1			
42	+ 36	+ 12	15.9	17.1			
43	+ 68	+ 23	16.2	17.3			
44	+ 20	+116	16.3	17.5			
45	− 90	+ 94	15.7	16.4			
46	+ 91	− 66	16.4	17.4			
47	− 89	+ 26	16.5	17.6			
48	− 4	+ 40	16.3	17.7			
49	− 98	− 19	16.0	16.9			
50	− 15	− 38	16.1	17.0			
51	+104	−305	16.5	17.5			
52	+ 82	+ 39	16.5	17.0			
53	+134	+129	16.4	17.3			
54	+121	+113	16.6	17.6			
55	+ 33	+106	16.5	17.5			

CATALOGUE—*Continued*

NGC 6402

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
56	− 68	−184	16.4	17.4			
57	+134	−116	16.3	17.6			
58	−123	− 34	16.4	17.3			
59	− 32	+ 30	16.4	17.7			
60	+ 41	+ 54	16.2	17.7			
61	+ 12	− 43	16.1	17.7			
62	−232	−154	16.5	17.6			
63	+122	− 63	16.5	17.4			
64	− 51	−169	16.5	17.5			
65	−125	+ 13	16.4	17.2			
66	−133	+ 37	16.6	17.4			
67	+ 34	+ 14	16.1	17.5			
68	+ 10	− 19	16.6	17.5			
69	+140	+ 26	16.6	17.3			
70	+ 43	− 23	16.0	17.2			
71	−116	− 50	16.5	17.7			
72	+122	−119	16.5	17.5			

Refs. 102, 113, 117, 123, 165. Plate in 123.

NGC 6426 α 17^h 42^m.4, δ +03° 12′

1	−170	+44					
2	−204	−53					
3	− 94	−33					
4	− 77	−74					
5	− 68	−22					
6	− 46	+52					
7	+ 10	− 4					
8	− 15	−53					
9	− 39	−85					
10	+ 46	+11					
11	+285	− 7					prob. field

Variables found by Baade, unpublished, ref. I; positions measured by Sawyer, ref. R.

NGC 6522 α 18^h 00^m.4, δ −30° 02′

1	−67.5	+34.4	17.29	17.65	32416.672	0.269949	222
2	+ 0.5	+39.7	17.18	18.28	32740.861	0.481903	133
3	+14.7	+37.2	17.30	18.11	32705.874	0.223892	44
4	+25.6	+ 8.3	17.27	18.59	32387.747	0.563826	170

CATALOGUE—*Continued*

NGC 6522

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
5	+66.0	−42.6	17.62	18.09	32349.871	0.222755	37
6	+96.5	+30.5	17.77	18.23	32416.753	0.192392	247
7	−51.5	+62.7	17.02	17.61		irreg.	172, field
8	−20.2	+49.6	15.94	17.11	32290.987	0.635019	27, field
9	−19.5	−64.9	16.79	17.27	32740.786	0.426448	232, field

New variables found by Baade, light elements by S. Gaposchkin, ref. I.

Baade considers Nos. 2, 3, 4, 5, cluster members, Nos. 1 and 6 possible members, 7, 8, 9, field stars. Numbers at right are those assigned by Baade and Gaposchkin to variables in this galactic centre field.

Ref. 164.

NGC 6528 α 18^h 01^m.6, δ −30° 04′

Baade finds a few variables from rich galactic centre field projected against this cluster, but considers no variables yet found are cluster members. Ref. I.

NGC 6535 α 18^h 01^m.3, δ −00° 18′

1	−197	+65	16.3	17.3			

1 variable unpublished? Ref. A.

Ref. 187 with plate.

NGC 6539 α 18^h 02^m.1, δ −07° 35′

1 unpublished variable. Ref. A.

NGC 6541 α 18^h 04^m.4, δ −43° 44′

1	−18	−126	12.5	[16			

New position for Wood's variable determined by McKibben-Nail, ref. J.

Refs. 63, 70. No map.

NGC 6553 α 18^h 06^m.3, δ −25° 56′

1	+186	+ 20				0.5642	
2	+ 75	−152				0.5818	prob. field
3	− 23	− 38				0.4886	
4	+ 16	− 2				]100	
5	− 71	− 12				]100	
Nova	−131:	−281:	8	[12	30955		N Sgr 1943

2 suspected variables.

Unpublished data on new variables from Thackeray, co-ordinates of nova by Thackeray and Morrisby, ref. P.

Refs. 51,166 (cluster no. is misprinted as 6533), 178. No map.

CATALOGUE—*Continued*

NGC 6584 α 18^h 14^m.6, δ −52° 14′

No variable in cluster. Ref. 71. No map.

NGC 6626 (Messier 28) α 18^h 21^m.5, δ −25° 54′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	+174.0	+188.5	15.1	16.4			
2	− 47.3	+ 63.1	14.3	14.8			
3	− 32.9	+111.0	14.6	15.4			
4	− 34.5	+ 33.6	13.6	14.8	32759.765	14.0 :	Sp.
5	− 44.8	+ 16.4	14.9	15.8			
6	+ 34.1	+ 50.4	14.3	15.2			
7	+172.2	+102.7	15.9	17.0			
8	+227.3	−222.3	14.9	16.3			
9	−158.6	−252.4	14.9	15.9			
10	+ 96	− 79	13.5	14.6			
11	− 14	+ 35	15.0	16.3			
12	+148	− 49	14.9	16.5			
13	− 92	− 24	15.2	16.7			
14	−131	−100	15.7	16.2			
15	−472	−186	15.8	17.0			
16	+432	−372	15.9	17.0			

Refs. 11, 14, 20, 165, 170. Plate in 20.

NGC 6656 (Messier 22) α 18^h 33^m.3, δ −23° 58′

1	− 54.0	− 10.0	13.9	14.9	29425.892	0.615543	348
2	+158.6	+ 69.2	13.1	14.3	29436.917	0.6418	857
3	+214.7	+420.2	14.6	[15.2	29434.918	0.340	
4	− 4.0	− 68.0	13.6	14.6	29438.96	0.716391	465
5	−178.2	− 33.8	12.0	12.8			158, Sp.
6	− 74.4	−100.0	13.6	14.5	29429.938	0.638547	299
7	−342.4	+411.2	13.5	14.5	29424.947	0.6495191	82
8	− 39.5	− 64.8	12.0	12.7	13373.6	61:	382, Sp.
9	−211.2	− 35.0	12.7	13.3	16761.5	87.71	135, Sp.
10	− 39.0	−125.0	13.5	14.6	29438.919	0.646020	389
11	− 14.4	+ 14.0	12.9	13.8	29436.917	1.69050	461, Sp.
12	+ 0.8	− 77.8	14.2	14.5	var.?		531
13	+ 76.4	+158.9	13.5	14.5	29439.920	0.6725217	719
14	+250.8	+486.4	13.8	[15.5	18160.6	200.2	field, Sp.
15	+115.3	− 83.2	14.0	14.5	29439.844	0.3721	804
16	+185.0	− 17.8	14.0	14.5	29429.938	0.3237	877
17	−438.0	+126.0	14.6	[15			
18	− 86	+433	13.7	14.4	29425.892	0.3249	259
19	− 33	+130	13.9	14.5	29424.947	0.384010	381

CATALOGUE—*Continued*

NGC 6656

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
20	−120	−123	13.7	14.5	29429.938	0.430061	221
21	+ 36	+ 88	13.8	14.8	29425.892	0.3265	601
22	−1089	+213	13.7	14.9	29424.947	0.624538	
23	− 5	− 14	14.1	14.9	29432.919	0.3557	505
24	− 26	+ 10	13.8	14.2	29425.892	0.415:	427
25	+326	+375	13.9	14.4	29425.892	0.4023595	952

Numbers at right identify star in Chevalier's catalogue, *Zô-Sè Ann.*, v. 10, C, pp. 1–51, 1918.

Refs. 11, 14, 20, 48, 68a, 81, 155, 165. Plates in 20, 155.

NGC 6712 α 18^h 50^m.3, δ −08° 47′

1	− 63	− 17	15.8	17.0			
2	+ 71	+ 17	14.0	14.9	28728:	105:	AP Sct
3	− 28	− 96	16.2	17.0			
4	+181	− 28	16.4	16.9			
5	+ 67	− 74	15.6	16.8			
6	+ 18	− 39	15.6	16.6			
7	−130	− 17	14.2	[17.0			
8	+ 24	+ 60	14.6	15.8			
9	− 1	+290	16.4	[17.4			
10	− 99	+ 30	15.2	16.0			
11	−122	−339	16.0	16.6			
12	+ 31	+ 38	16.0	17.4			

Co-ordinates of No. 1 shifted slightly to conform with other variables. Some unpublished variables, ref. A.

Refs. 36, 151, 187. Chart in 151, plate in 187.

NGC 6715 (Messier 54) α 18^h 52^m.0, δ −30° 32′

1	+ 83	+ 10	16.7	17.5
2	− 6	+ 90	16.8	17.5
3	− 14	+ 179	17.1	
4	− 38	+ 311	17.1	
5	− 129	+ 43	17.2	
6	+ 210	− 177	17.0	
7	+ 54	− 165	17.2	
8	+ 365	− 330	16.8	17.6
9	− 67	− 637		
10	+ 115	− 530		
11	− 106	−1086		
12	− 220	− 248	16.7	17.3
13	− 238	+ 451		

CATALOGUE—*Continued*

NGC 6715

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
14	+ 240	+ 213	17.2				
15	+ 124	− 63	17.1				
16	+ 87	− 917					
17	+ 697	− 435					
18	+ 511	+ 382					
19	−1260	− 190	16?				
20	+ 106	+ 95	17.2				
21	+ 85	− 231	17.2				
22	+ 11	− 171	17.2				
23	+ 240	+ 210	17.2				
24	+ 453	+ 55					
25	+ 147	+ 337	16.8	17.4			
26	+ 187	− 150					
27	+ 209	− 306	17.1				
28	+ 68	+ 161	17.1				

Ref. 180 with plate.

NGC 6723 α 18^h 56^m.2, δ −36° 42′

1	+ 75.6	−197.4	15.10	15.80	23618.56	0.5384149
2	+135.2	− 76.9	14.45	16.05	23618.68	0.5048
3	−244.9	+ 6.0	14.70	15.80	23618.90	0.4949
4	+ 17.1	+ 77.4	14.55	15.90	23618.79	0.4524
5	− 4.8	+ 50.8	15.20	16.00		0.49
6	+ 7.1	+ 46.2	14.90	16.05	23618.80	0.4812
7	+197.9	− 70.1	15.20	15.75	23618.91	0.4675
8	+ 15.9	+ 10.8	14.75	15.60		0.53
9	+ 73.6	+ 17.2	14.70	15.80	23618.71	0.5779
10	+149.6	+ 84.2	15.10	15.60	23618.60	0.33855
11	+133.3	+228.8	14.85	15.65	23618.70	0.5342935
12	+ 45.1	− 45.0	14.95	15.85	23618.53	0.5333
13	− 46.8	− 70.8	14.80	16.00	23618.48	0.5078
14	− 37.9	− 43.0	14.95	15.80	23618.91	0.6190
15	− 93.4	+165.7	14.40	15.80	23618.74	0.4355162
16	− 46.4	+ 91.6	14.75	15.65	23618.67	0.4114
17	+ 43.9	−102.0	14.4	15.7		0.5301595
18	−139.2	− 24:	14.6	15.3		0.5263801
19	−174.0	−120:	14.6	15.5		0.5347108

The three variables found by van Gent have been given numbers 17, 18, 19.
Refs. 14, 20, 73, 74, 91, 96. Plate in 20, charts in 96.

NGC 6752 α 19^h 06^m.4, δ −60° 04′
1 variable, 4′ from cluster centre.
Refs. 11, 14, 20. No map.

CATALOGUE—*Continued*

NGC 6760 α 19^h 08^m.6, δ +00° 57′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	+57	− 57	15.7	17.0			
2	− 6	−100	16.7	17.2			
3	+31	− 10	15.5	[17.4			
4	+42	+ 39	15.4	[17.5			

2? unpublished variables. Ref. A.
Ref. 187 with plate.

NGC 6779 (Messier 56) α 19^h 14^m.6, δ +30° 05′

1	+ 44.69	+ 74.10	15.0	16.2	30899.341	1.510019	363, Sp.
2	+ 18.16	+ 33.09	15.1	15.6			326
3	+ 25.10	+ 91.69	14.4	15.1		semireg.	337, Sp.
4	−112.13	−159.46	15.9	16.4			141
5	+ 6.79	−134.78	14.4	15.2		semireg.	305
6	− 2.02	+ 37.06	12.9	14.8	30172.7	90.02	284, Sp.
7	+293.48	−213.24	15.6	16.3		irreg.	504
8	− 97.63	−335.90	15.9	16.7		semireg.	150
9	+177	+525	15.6	16.1		semireg.	
10	−431.53	+ 88.33	16.4	17.4	30967.473	0.5988948	
11	−415.58	+283.80	15.5	16.3	33152.555	0.07564	17
12	−243.96	− 95.41	15.6	16.4			68

Right-hand column gives identification no. in Küstner's Catalogue, *Bonn Veroff.*, no. 14, 1920.
Refs. 35, 51, 134, 146, 154, 165, 169, 171, 187. Plates in 51, 134, 154.

NGC 6809 (Messier 55) α 19^h 36^m.9, δ −31° 03′

1	+304.2	− 55.6	32413.39	0.57997286	HV 658
2	−214.9	− 26.0	32467.18	0.4061601	HV 659
3	+ 78	−304	32413.22	0.6619023	HV 12213
4	+108	+ 59	32413.34	0.3841702	HV 12214
5	− 41	− 74		0.2?	HV 12215
6	+111	− 20	32413.32	0.388904	HV 12216

Refs. 20, 75, 77, 174. Plate in 20.

NGC 6838 (Messier 71) α 19^h 51^m.5, δ +18° 39′

1	+140	+ 24	13.5	14.9		Z Sge
2	+ 44	−146	13.8	14.7		4873
3	+ 44	− 70	15.2	17.0		ecl.
4	+266	+ 31	14.7	15.3		

Number for Var. 2 from Russian catalogue of suspected variables, 1951.
Refs. 83a, 182, 187 with plate.

CATALOGUE—*Continued*

NGC 6864 (Messier 75) α 20^h 03^m.2, δ −22° 04′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	+ 15.6	−83.4					
2	− 9.0	+54.0					
3	+ 18.0	+85.5					
4	− 18.0	−84.6					
5	+108.0	−36.0					
6	+ 8.4	−81.0					
7	− 24.6	+78.0					
8	− 13.5	−41.4					
9	+ 45.6	−24.0					
*10	− 43.5	+50.4					
11	+121.2	+84.0					
12	+ 39.6	+75.0					

*Suspected. Four additional suspected variables, numbered 13–16, are omitted.
Ref. 51, with plate.

NGC 6934 α 20^h 31^m.7, δ +07° 14′

1	− 45	− 39	15.9	17.3
2	− 40	− 14	16.0	17.4
3	0	+ 58	15.9	17.3
4	+ 39	+ 58	15.6	17.2
5	+ 59	+221	15.9	17.2
6	− 27	− 33	16.1	17.5
7	+ 92	+ 59	16.2	17.3
8	+100	+ 50	16.3	17.1
9	+ 63	+ 18	15.9	17.4
10	−135	+ 72	15.8	17.2
11	+ 17	+ 28	16.6	17.5
12	+ 29	− 44	15.6	17.1
13	− 47	+ 25	16.0	17.2
14	− 7	− 90	15.8	17.4
15	+ 10	− 53	15.2	15.8
16	+ 36	+ 18	16.1	17.4
17	− 73	−107	16.2	17.4
18	+ 49	− 8	16.1	17.1
19	+ 30	+ 1	15.9	17.4
20	− 26	+ 17	16.0	17.3
21	− 35	− 3	16.1	17.5
22	−240	−173	16.0	17.2
23	− 31	− 16	16.4	17.4
24	+ 37	− 53	16.3	17.3
25	+ 50	+ 37	15.9	17.4
26	+ 31	−196	16.4	17.2
27	−148	+180	16.2	17.2
28	−234	+100	15.7	17.3

CATALOGUE—*Continued*

NGC 6934

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
29	− 85	−183	15.7	17.3			
30	+161	+127	16.2	17.2			
31	+146	−101	16.0	17.3			
32	− 10	+ 51	15.8	17.1			
33	+ 37	+ 12	16.0	17.2			
34	− 21	+ 16	16.1	17.4			
35	+157	−142	16.0	17.5			
36	+ 10	− 35	15.6	17.0			
37	+ 23	+ 10	16.0	17.3			
38	+ 12	− 18	16.2	17.3			
39	+ 8	− 16	16.1	17.3			
40	− 8	+ 26	15.7	16.3			
41	+ 30	− 39	16.2	17.5			
42	+ 55	+ 20	15.9	17.3			
43	+ 21	+ 27	15.9	17.4			
44	− 43	− 30	15.8	17.3			
45	− 32	− 9	15.8	17.2			
46	+ 14	− 24	16.4	17.4			
47	+ 10	− 26	16.3	17.3			
48	+ 33	+ 52	16.0	17.4			
49	+ 13	− 55	16.2	17.3			
50	+ 15	− 37	16.4	17.3			
51	+ 7	− 25	15.4	16.1			

Refs. 102, 107, 113, 123. Plate in 123.

Numerous periods, all RR Lyrae type, are nearly ready for publication by Sawyer, ref. R

NGC 6981 (Messier 72) α 20^h 50^m.7, δ −12° 44′

1	+ 43.5	− 54.0	16.45	17.25	33129.400	0.619818
2	+ 99.0	+194.4	15.95	17.30	33126.405	0.4652687
3	− 52.5	− 58.5	16.10	17.30	33809.553	0.4976104
4	−106.5	+ 37.5	16.25	17.35	33147.462	0.5524877
5	− 38.4	− 21.6	16.40	17.43	22163.738	0.4991
6	+ 78.0	+ 78.6	16.70	17.10		
7	− 3.6	+ 55.5	16.20	17.29	22163.896	0.52463
8	− 6.6	+ 89.4	16.20	17.50	33145.372	0.568392
9	+ 11.4	+ 50.4	16.30	17.34	22162.61	0.5902
10	− 48.6	− 73.5	16.20	17.30	33857.504	0.5581805
11	+ 57.0	− 36.6	16.35	17.25	33856.570	0.521466
12	+ 9.0	− 21.6	16.31	17.17	22163.90	0.4111
13	+ 13.5	+ 17.4	16.10	17.15	22161.907	0.54182
14	− 13.5	+ 36.0	16.40	17.06	22163.90	0.5904
15	− 64.5	− 21.0	16.20	17.35	33125.435	0.5403524
16	− 4.5	− 19.5	16.30	17.37	22163.83	0.5641

CATALOGUE—*Continued*

NGC 6981

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
17	+ 3.6	− 43.5	16.45	17.35	33125.483	0.573539	
18	− 26.4	− 37.5	15.70	16.28	22162.88	0.52016	
19	+ 3.0	+112.5	17.15	17.30	not var.		
20	− 54.6	+ 15.0	16.50	17.40	33857.420	0.595046	
21	− 82.5	+ 12.6	16.10	17.50	33145.370	0.5311618	
22	−113.4	+ 1.5	17.10	17.25	not var.		
23	− 99.0	+116.4	16.20	17.25	33834.550	0.5850834	
24	− 15.6	− 24.0	16.20	16.55	22161.92	0.4973:	
25	−133.5	+ 67.5	16.50	17.15	33481.810	0.3533494	
26	− 91.5	− 45.0	16.90	17.20			
27	+209.4	−234.0	15.85	17.25	33856.560	0.6739040	
28	− 65.4	+ 81.0	16.30	17.15	33853.437	0.5672533	
29	+ 36.0	− 52.5	16.40	17.37	22161.83	0.36865	
30	+ 71.4	− 97.5	16.50	16.90			
31	+ 5.4	+ 36.6	16.50	17.22	22162.02	0.55465	
32	−138.0	− 42.0	16.55	17.30	33834.545	0.5282821	
33	+ 2.4	− 60.6	16.95	17.25			
34	− 6.0	+ 7.5	16.06	16.73			
35	+231	+ 27	16.2	17.4			
36	− 12	0	16.0	16.8			
37	+ 7	− 8	15.5	16.5			
38	+ 5	− 9	16.6	17.3			
39	+195	+243	16.8	17.6			
40	+ 18	+ 16	16.4	17.4			
41	− 15	− 20	16.7	17.5			

Refs. 36, 51, 52, 185, 187. Plates in 51, 185, 187.

NGC 7006 α 20^h $59^m.1$, δ +16° 00′

1	−177.9	+114.8	
2	− 35.3	− 37.3	
3	− 24.4	+ 34.2	
4	− 21.0	− 41.1	not var.
5	− 20.9	+ 38.4	
6	− 13.5	− 44.5	
7	+ 3.2	− 36.9	not var.
8	+ 34.4	+ 13.5	
9	+ 39.4	+ 16.6	var.?
10	+ 42.8	− 11.8	
11	+148	+ 50	
12	+122.0	− 64.0	
13	+102.7	+ 40.2	
14	+ 35.3	+128.3	
15	− 11.5	+114.8	
16	− 39.6	+135.5	

CATALOGUE—*Continued*

NGC 7006

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
17	− 99.3	+ 85.5					
18	− 29.6	− 89.5					
19	− 0.6	− 25.3			26586.	252:	
20	− 21.2	− 24.4					
21	− 21.5	− 18.4					
22	− 12.6	− 15.8					
23	− 27.6	− 7.5					
24	− 25.8	− 2.9					
25	− 19.2	+ 5.2					
26	− 10.6	− 2.9					
27	− 11.8	+ 0.3					
28	− 15.8	+ 4.3					
29	+ 35.0	+ 31.6					
30	+ 5.2	+ 16.6					
31	+ 10.0	+ 11.2					
32	+ 20.9	+ 13.8					
33	+ 31.9	+ 22.4					
34	+ 26.4	+ 9.2					
35	+ 36.2	− 2.0					
36	+ 25.5	− 3.7					
37	+ 18.9	− 3.4					
38	+ 21.5	− 18.4					
39	+ 11.5	− 25.3					
40	+ 9.7	− 14.3					
41	+ 1.4	− 11.2					
42	+ 9.5	− 7.5					
43	− 4.0	− 28.7					

Data supplied by Sandage who has prepared Hubble's work on these variables for publication in *P.A.S.P.*, with print. Co-ordinates of all variables now on Hubble's system, which differs from Shapley and Mayberry's by x = +3″.2, y = +1″.1. Ref. M.

Refs. 51, 57.

NGC 7078 (Messier 15) $\alpha\ 21^h\ 27^m.6$, $\delta\ +11°\ 57'$

1	−118.6	+ 24.4	14.36	15.54	15021.990	1.437478	156, Sp.
2	−171.7	+ 6.0	15.14	15.95	15021.078	0.684270	91
3	−248.0	− 46.8	15.34	16.03	15021.097	0.3891545	61
4	−112.6	−163.6	15.31	16.08	15021.277	0.3135750	162
5	−100.3	−212.5	15.33	16.00	15021.291	0.384619	186
6	+ 24.4	+ 76.5	15.20	16.29	15021.603	0.665971	680
7	+ 10.1	+ 73.2	15.56	16.16	15021.134	0.367586	611
8	− 0.6	+126.8	15.22	16.14	15021.330	0.646251	564
9	+ 15.6	+138.7	15.12	15.98	15021.425	0.715284	632
10	+125.6	+ 1.7	15.50	16.04	15021.370	0.386395	976
11	+172.3	− 21.8	15.28	16.07	15021.243	0.3435678	1034

CATALOGUE—*Continued*

NGC 7078

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
12	+163.0	− 50.7	15.22	16.13	15021.090	0.592934	1017
13	+126.6	− 68.8	15.12	16.20	15021.365	0.574961	980
14	+ 84.1	−256.2	15.44	16.00	15021.128	0.381999	905
15	+ 81.7	−304.1	15.22	16.16	15021.064	0.584386	894
16	+101.9	+129.8	15.50	15.97	15021.556	0.69464	942
17	+ 83.7	+110.6	15.40	15.90	15021.216	0.666979	901
18	+ 77.3	+100.4	15.50	16.00	15021.331	0.37816	886
19	+111.3	+160.4	14.85	16.10	15021.552	0.572293	964
20	+ 81.2	− 9.8	15.27	16.17	15021.261	0.700570	891
21	+ 34.4	− 57.5	15.25	16.20	15021.322	0.624690	732
22	−330.8	− 45.8	15.18	16.04	15021.566	0.721728	30
23	+192.0	+256.1	15.07	15.95	15021.198	0.632690	1053
24	−106.7	− 6.1	15.42	16.17	15021.055	0.369697	173
25	+302.9	− 10.7	15.10	16.00	15021.499	0.665329	1093
26	+ 23.5	+331.9	15.33	15.97	15021.272	0.402326	675
27	+222.5	+248.2	var.?				1065
28	+309.9	+534.2	15.19	16.15	15021.632	0.670640	
29	+163.3	+212.2	15.13	16.06	15021.281	0.574062	1020
30	−165.0	− 3.4	15.42	16.00	15021.293	0.405976	102
31	−112.6	+245.6	15.30	16.07	15021.375	0.435693	164
32	− 50.4	+107.8	15.14	15.98	15021.066	0.605400	332
33	− 41.2	− 29.4					380?
34	− 55.4	− 54.5	var.?				322
35	− 34.0	−163.6	15.40	16.11	15021.278	0.383997	412
36	− 27.7	− 81.6	15.18	16.26	15021.371	0.624142	437
37	− 25.2	− 77.4					451
38	+ 7.6	−146.2	15.29	16.16	15021.328	0.375274	600
39	+ 20.5	−124.8	15.34	16.14	15021.259	0.389984	659
40	+131.8	−116.7	15.34	16.00	15021.320	0.377390	986
41	+ 62.9	− 55.4					835
42	+227.5	− 36.8	15.34	16.07	15021.110	0.360167	1066
43	+416.7	+103.2	15.25	15.88	15021.041	0.406744	1122
44	+ 91.3	+ 3.0	15.20	16.11	15021.373	0.595568	920
45	+ 66.9	− 31.0	15.19	16.14	15021.521	0.66210	854
46	+ 56.0	+ 33.2	15.40	16.32	15021.210	0.692730	814?
47	+ 45.7	− 4.3	15.32	16.04	15021.604	0.662900	
48	+ 59.7	+150.6	15.35	16.17	15021.266	0.378881	827
49	+ 40.3	+166.6	14.75	15.35	15021.037	0.417972	765
50	+165.0	+100.0	15.35	16.00	15021.262	0.29850	1022
51	+ 6.2	+ 91.4	15.51	16.03	15021.158	0.397757	590
52	+192.4	− 22.6	15.12	16.24	15021.106	0.577608	1055
53	− 92.6	−111.0	15.28	15.91	15021.301	0.414135	210
54	+ 10.8	+ 88.4	15.58	16.13	15021.240	0.398325	612
55	+ 65.3	− 18.8	15.49	16.30	15021.675	0.719615	850

CATALOGUE—*Continued*

NGC 7078

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
56	+ 57.4	0.0	15.19	16.11	15021.249	0.570307	820
57	+ 75.2	− 56.4	15.26	15.97	15021.243	0.348935	872?
58	− 55.6	+ 8.8	15.64	16.32	15021.388	0.420463	321
59	+ 41.3	+ 41.5	15.50	16.10	15021.117	0.565260	770
60	+ 53.4	− 59.3	15.29	16.00	15021.118	0.691852	805
61	− 67.3	− 40.2	15.43	16.16	15021.526	0.61030	281
62	− 71.6	+ 39.6	15.65	16.26	15021.161	0.38818	264
63	+ 49.8	+ 31.0	15.54	16.44	15021.076	0.67370	790?
64	− 46.2	+ 19.1	15.61	16.24	15021.207	0.351695	350
65	−102.4	− 38.7	15.43	16.18	15021.377	0.756048	177
66	− 68.4	−112.4	15.41	16.10	15021.191	0.379330	275
67	− 86.6	− 10.4					227
68	− 31.8	+ 12.6					420
69	− 37.0	− 25.2					
70	− 34.0	− 19.2					
71	− 34.8	− 12.6					
72	− 2.2	+ 34.8					556
73	− 3.7	+ 20.0					
74	+ 36.3	− 85.8					754
75	+ 2.2	− 30.3					
76	+ 0.7	− 28.9					
77	− 11.8	− 22.9					
78	− 6.7	+ 47.4					533
79	+ 21.5	− 23.7					
80	− 47.4	− 26.6					345
81	− 21.5	− 5.9					
82	− 20.7	+ 1.5					
83	+ 16.3	− 7.4					
84	+ 18.5	− 16.3					
85	+ 20.7	+ 2.2					
86	+ 12.6	+ 4.4	13.4	14.6			prob. Cep.
87	+ 23.7	− 23.7					
88	+ 2.2	+ 26.6					
89	− 23.7	− 6.7					463
90	+ 31.1	+ 4.4					
91	+ 67.3	+ 28.9					847
92	+ 9.6	− 25.2					610
93	+ 27.4	− 33.3					705
94	+ 3.7	+ 28.9					
95	+ 5.2	− 40.0					599

8 variables still unpublished? Ref. 76. Numbers at right are from Küstner's catalogue, *Bonn Veröff.*, no. 15, 1921. (No. 37 might be 452.)

Refs. 14, 17, 20, 34, 39, 41, 45, 76, 95, 100, 128, 165, 172. Plates in 20, 41, 172.

CATALOGUE—*Continued*

NGC 7089 (Messier 2) α 21^h 30^m.9, δ −01° 03′

No.	x″	y″	Magnitudes Max.	Min.	Epoch of Maximum	Period	Remarks
1	+ 25.6	+ 79.4	13.2	14.8	26607.800	15.5647	Sp.
2	− 45.8	+ 71.1	14.6	16.1	21454.971	0.527858	
3	+222.9	− 39.6	15.1	16.4	26921.936	0.619705	
4	− 26.8	+ 31.5	15.2	16.6	26628.644	0.564247	
5	− 44.4	+ 2.1	13.2	14.9	26628.644	17.5548	Sp.
6	+ 11.8	− 45.4	13.2	14.9	22162.928	19.3010	Sp.
7	+153.0	−189.2	15.1	16.4	27274.901	0.594857	
8	− 66.9	− 56.8	15.1	16.4	27273.896	0.643677	
9	−173.2	−128.2	15.2	16.4	27274.901	0.609291	
10	+ 90.6	+ 38.8	15.2	16.4	27275.909	0.466910	Sp.
11	+ 85	+ 8	12.5	14.0	31259.8	67.086	
12	− 62	+ 43	15.1	16.5	26628.776	0.665616	
13	− 77	+ 73	15.1	16.4	26924.972	0.706616	
14	+ 83	− 68	15.4	16.4	20749.843	0.693785	
15	+ 80	− 76	15.7	16.4	26944.880	0.430152	
16	− 31	− 27	15.3	16.5	27275.950	0.655917	
17	+ 2	− 63	15.2	16.3	27274.901	0.636434	

Refs. 11, 13, 14, 16, 20, 88, 102, 112, 123, 165, 169. Plates in 20, 112, 169.

NGC 7099 (Messier 30) α 21^h 37^m.5, δ −23° 25′

1	+ 30.0	− 60.6	14.98	16.31	32414.485	0.74365	
2	+ 58.6	−126.2	14.92	16.04	32060.46	0.6535049	
3	− 96.7	− 39.6	14.91	16.06	32039.59	0.69632	
4	−339:	− 51:	16.4	[18	32450.	11–15	SS Cyg

Refs. 11, 14, 20, 167, L. Plates in 20, 167.

NGC 7492 α 23^h 05^m.7, δ −15° 54′

1	+1.2	+96.6

4 suspected variables and 8 unpublished variables.
Refs. 51, 87. Plate in 51.

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CORRESPONDENCE OF RECENT YEARS PERTAINING TO THIS CATALOGUE

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