COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS
Number 5181

Konkoly Observatory
Budapest
28 September 2001

HU ISSN 0374 – 0676

NEW VARIABLE STARS ALONG THE NORTHERN MILKY WAY

DAHLMARK, LENNART

Residence Jeanne d'Arc, 176 Avenue Majoral Arnaud, F-04100 Manosque, France

This report summarizes the results of a variable-star search in the $20° \times 15°$ area centered at $21^{h}22^{m}/+30°$ (1950). This is a continuation of the series covering a broad region of the northern Milky Way. The basic procedures involved are the same as in previous reports (see *e.g.* Dahlmark 2000).

The light curves were prepared from the following photographic materials. Seventeen yellow/blue plate-pairs (Kodak 103a-D + GG11 filter and 103a-O unfiltered) were exposed between 1967 and 1982. In addition thirty-three films (Kodak TechPan 4415 + GG495 filter) were taken in the years 1992–2001. Three exposures with a 20-cm $f/1.5$ Schmidt camera taken between 1995 and 1997 were examined and used to prepare finder charts. Ten plate- or film-pairs were scanned for variables with a blink comparator and with four stereo comparators used in tandem. Magnitudes were determined in a stereomicroscope using comparison stars taken from the Guide Star Catalogue (Lasker *et al.* 1990). The yellow-light magnitudes 'm_v' shown in Table 2 are thus tied to the GSC (northern) magnitude scale and will be systematically somewhat brighter than standard Johnson V.

In this field fifty-four new variables were found. Table 1 shows identifications and the best available positions for the new stars. The coordinates were drawn, in descending order of preference, from the 2MASS point-source catalogue (second release, Skrutskie *et al.* 2000), GSC-ACT (Gray 1999), USNO–A2.0 (Monet *et al.* 1998), or the recent GSC-2.2 (STScI 2001). One star is bright enough to appear in Tycho-2 (Høg *et al.* 2000). LD 385 is one of a close pair whose position was estimated ($\pm 2''$) on the Digitized Sky Survey via the Goddard SkyView utility. The source of the positions is coded in column 's' of Table 1 as follows: A = USNO–A2.0, G = GSC-ACT, g = GSC-2.2, M = 2MASS, S = SkyView, T = Tycho-2. The MSX catalogue (Price *et al.* 2001) was a useful aid in identifying some of the stars. MSX identifications are made for objects not appearing in the IRAS catalogues. The final column gives other identifications from SIMBAD and external catalogues that match in position and object type. 'DO' numbers refer to the Dearborn red stars catalogue (Lee *et al.* 1947), with spectral types quoted in parentheses; 'CGCS' numbers are from the second Stephenson carbon-star catalogue (Stephenson 1989).

LD 402 was identified as V1904 Cyg after the observations were completed. The period determined here is similar to that found by Zemliannikova (1986). Several stars have been independently reported as variable by other amateur observers. Among these LD 383 = Had V18 = V422 Vul was named on a recent GCVS name-list. For most of the remainder usually only a few observations have been previously available.

Table 1: Positions and identifications

Name	RA (2000)	Dec	s	GSC	IRAS	Other IDs
LD 367*	20 34 45.85	+32 48 13.2	G	2690-1071	20327+3237	
LD 368	20 37 00.15	+33 54 08.9	M		20350+3343	
LD 369	20 37 01.19	+30 39 45.6	M		20349+3029	
LD 370	20 37 11.25	+34 22 14.6	M		20352+3411	
LD 371*	20 38 19.81	+34 12 20.7	M		20363+3401	[PCC93] 420
LD 372*	20 39 01.13	+27 29 33.1	A			
LD 373	20 39 50.10	+34 37 18.0	G	2694-2096	20378+3426	
LD 374	20 43 00.54	+33 24 43.6	M		20409+3313	
LD 375*	20 43 21.11	+26 24 36.8	g			
LD 376	20 44 12.47	+26 12 46.3	A		20420+2601	
LD 377	20 45 01.24	+27 15 07.3	A			
LD 378	20 49 05.91	+23 21 51.9	M			
LD 379	20 53 09.51	+32 31 04.8	g			
LD 380*	21 01 29.92	+25 03 42.6	G	2176-1341	20593+2451	
LD 381	21 04 05.56	+26 32 11.1	M		21019+2620	
LD 382	21 04 05.52	+32 30 13.2	M	2705-0784		
LD 383*	21 05 11.04	+26 54 14.5	A		21030+2642	V422 Vul
LD 384	21 05 32.23	+35 25 05.9	M	2709-2776		
LD 385*	21 07 55.6	+35 35 21	S			
LD 386*	21 08 01.30	+23 43 44.6	G	2173-0719	21057+2331	StM 536
LD 387	21 09 01.23	+27 31 23.2	T	2181-1309	21068+2719	DO 20055 (M6)
LD 388*	21 10 14.82	+31 29 40.7	M		21081+3117	
LD 389*	21 10 19.33	+33 28 53.8	M			
LD 390*	21 10 47.76	+34 20 06.4	M		21087+3407	
LD 391*	21 11 13.60	+34 19 14.3	M			
LD 392*	21 11 19.97	+31 23 19.1	G	2702-0676	21092+3111	
LD 393	21 13 43.61	+28 00 13.9	G	2194-2252	21115+2747	
LD 394*	21 14 12.26	+36 39 00.0	g			[D75] 130 (M7)
LD 395	21 16 45.00	+29 13 39.5	G	2198-1085	F21145+2900	
LD 396	21 17 09.56	+31 07 49.9	M	2702-1537	21150+3055	
LD 397	21 18 34.71	+33 44 30.8	M			
LD 398	21 19 39.94	+35 00 11.1	M	2711-0059		
LD 399	21 19 53.00	+35 08 57.9	M	2711-0433		
LD 400	21 20 19.48	+28 08 57.6	M			
LD 401	21 20 31.92	+33 07 17.6	M	2707-1462		CGCS 5254 = DO 20294
LD 402*	21 24 43.63	+33 59 17.3	M			V1904 Cyg
LD 403*	21 25 18.84	+27 03 25.8	G	2195-1274		
LD 404	21 25 27.63	+22 25 42.1	G	1675-1355	21231+2212	
LD 405	21 29 55.82	+23 13 05.9	G	2188-0931		
LD 406	21 31 17.65	+26 44 06.4	A		21290+2630	
LD 407	21 31 54.64	+33 03 02.8	M	2708-1539		MSX G081.7116–13.4145
LD 408	21 35 09.76	+31 11 35.9	M	2704-0321		MSX G080.8816–15.2254
LD 409	21 36 04.16	+36 13 47.0	G	2729-2282		MSX G084.5981–11.7114
LD 410	21 39 32.32	+30 03 51.1	A			MSX G080.7727–16.6915
LD 411	21 39 55.09	+31 19 16.1	A			
LD 412	21 43 00.06	+32 41 38.9	G	2721-1053		MSX G083.2033–15.2747
LD 413	21 43 10.31	+35 45 13.6	G	2729-2394		
LD 414	21 43 35.93	+37 22 34.9	A		21415+3708	
LD 415	21 44 47.46	+34 27 15.3	G	2725-1671	21426+3413	MSX G084.7122–14.2212
LD 416	21 46 09.65	+35 56 16.3	G	2730-0323	21440+3542	
LD 417	21 51 55.43	+29 17 13.3	G	2214-1992		MSX G082.2985–19.0853
LD 418	21 52 58.57	+33 48 29.1	G	2726-1773	F21508+3334	
LD 419	21 59 40.64	+29 39 59.3	G	2215-0401	21574+2925	
LD 420	22 07 09.90	+28 28 37.2	G	2216-1795	F22048+2813	

Notes:

LD 367 northern star of a small trio, GSC position possibly slightly in error.
LD 371 Yoshida (2000c) variable MisV1031.
LD 372 northeastern star of a pair.
LD 375 southeastern star in a tight ($\sim 7''$) line of three. Faint on POSS-I plates (red $\sim 18^{\rm m}$, not present on the blue plate).
LD 380 Yoshida (2000b) variable Mis V0967.
LD 383 Haseda (1999) variable Had V18, GCVS designation assigned in 76th name-list (Kazarovets *et al.* 2001).
LD 385 southwestern star of a pair.
LD 386 Collins (2000) variable Q1991/78.
LD 388 Wakuda variable 34.
LD 389 Hiraga variable Hrm V_J211021+332912.
LD 390 Collins (2000) variable Q2000/247.
LD 391 not red: 2MASS $J - K = 0.3$.
LD 392 Yoshida (2000a) variable Mis V0768.
LD 394 Hiraga variable Hrm V_J211412+363905; southeastern star of a close pair.
LD 402 GCVS identification confirmed on chart in Zemliannikova (1986).
LD 403 faint companion on south.

Table 2: Elements of variation

Name	max (m_v)	min	$b-r$	type	epoch JD 2400000+	period (days)
LD 367	11.3	13.3		SR	50765	302
LD 368	13.0	16.0		M	51895	433:
LD 369	12.1	15.0	4.3	M	51109	402
LD 370	12.4	14.5	6.3	SRa	51867	400
LD 371	13.4	>16.0		I		
LD 372	13.3	15.0	3.9	SRa	50637	359:
LD 373	11.8	13.2	2.9	Lb		
LD 374	13.7	>16.0		I		
LD 375	12.5	>14.8	4.4	SRa	51432	392
LD 376	12.0	15.8	4.6	M	51432	347
LD 377*	12.5	>16.0	2.8	M	50691	163
LD 378	13.1	>16.0	2.9	SR		
LD 379*	13.2	>16.2	3.2	M	51432	800?
LD 380	12.0	15.0	3.1	M	50637	335
LD 381	12.2	15.0	2.8	M	51513	320
LD 382*	11.0	15.5	2.5	SR	51931	400?
LD 383	10.5	14.9	3.3	M	51867	310
LD 384*	12.8	14.2	2.5	E	51931	<73
LD 385	13.1	14.4		SR	51432	289
LD 386	10.5	14.4	3.7	M	51836	332
LD 387	9.7	11.1	3.3	Lb		
LD 388	11.2	14.3	6.9	SRa	51432	360:
LD 389*	11.3	14.6	3.6	M	50691	280
LD 390	10.4	14.9	2.8	M	51432	382
LD 391	12.5	14.6	0.5	Lb		
LD 392	11.2	>15.0	2.3	M	51461	336
LD 393	11.7	>16.0		M	51895	369
LD 394	10.6	>14.7		M	50637	363
LD 395	12.2	>14.4	2.8	Lb		

Table 2 (cont'd.): Elements of variation

Name	max	min	$b-r$	type	epoch	period
	(m_v)				JD 2400000+	(days)
LD 396	11.5	15.0	2.5	M	51641	299
LD 397	13.5	15.9	2.3	SRa	51908	240:
LD 398	12.1	13.3	3.5	Ib		
LD 399	11.8	13.3	2.1	Ib		
LD 400	12.4	14.1	2.5	Lb		
LD 401	10.7	13.2	5.1	SRa	51836	387
LD 402*	11.3	>15.0	2.4	M	51867	282:
LD 403	13.3	15.6	2.3	SRa	51931	391
LD 404	11.9	13.4	3.0	SRa		
LD 405	12.0	13.0	2.5	Lb		
LD 406	11.1	>15.0	3.6	M	51432	350
LD 407	11.5	15.6	2.6	M	51895	231
LD 408	12.7	14.8	3.0	SRa	51542	235
LD 409	11.3	12.9	2.7	SR		
LD 410	14.0	15.5	2.5	SRb		
LD 411	12.5	>16.0	2.6	M	50716	746
LD 412	11.4	13.7	2.9	Lb		
LD 413	13.2	15.1	1.5	SR	51836	380
LD 414	12.0	15.0	2.6	SR	51513	404:
LD 415	10.8	>16.0		Lb		
LD 416	11.6	15.2	2.8	M	51513	320
LD 417	11.9	13.5	3.5	Lb		
LD 418	11.6	13.1	1.7	SR		
LD 419	12.0	13.5	2.3	SR		
LD 420	12.0	16.1	2.2	M	51641	195

Notes:

LD 377 mr = 16.8 in USNO-A2.0.

LD 379 period near $608^{\rm d}$ from 1967 to 1977, and $800^{\rm d}$ from 1995 to 2001.

LD 382 periodicity not always apparent.

LD 384 Six minima observed; the true period is probably some small fraction of the period given. P. Guilbault (priv. comm.) suggests from preliminary observations that the star is continuously variable, and probably of the β Lyr or W UMa type.

LD 389 Hiraga also derives a period of $280^{\rm d}$.

LD 402 Zemliannikova (1986) obtains a period of $290\overset{\rm d}{.}4$.

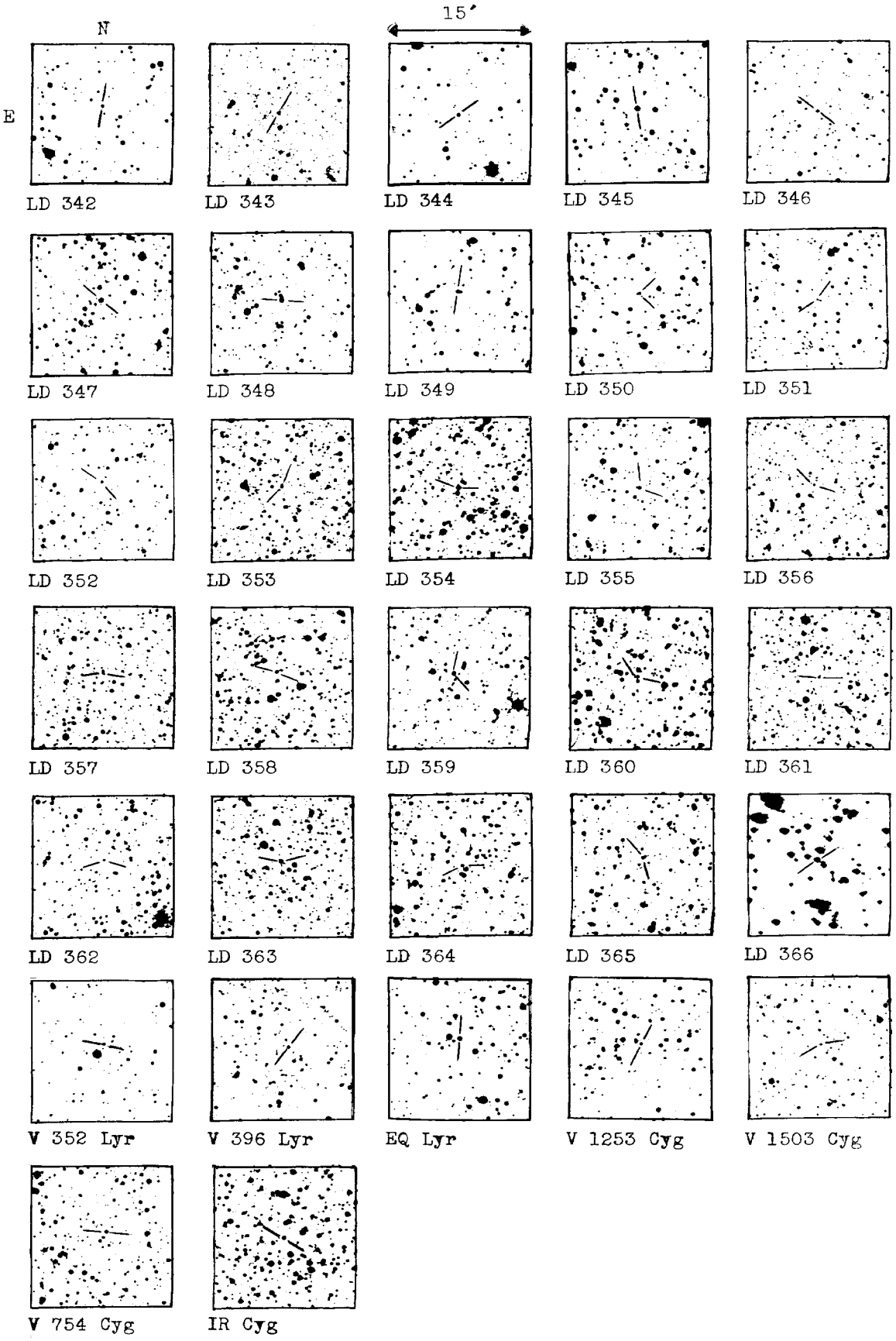
15′
N
E
LD 342
LD 343
LD 344
LD 345
LD 346
LD 347
LD 348
LD 349
LD 350
LD 351
LD 352
LD 353
LD 354
LD 355
LD 356
LD 357
LD 358
LD 359
LD 360
LD 361
LD 362
LD 363
LD 364
LD 365
LD 366
V 352 Lyr
V 396 Lyr
EQ Lyr
V 1253 Cyg
V 1503 Cyg
V 754 Cyg
IR Cyg

Figure 1.

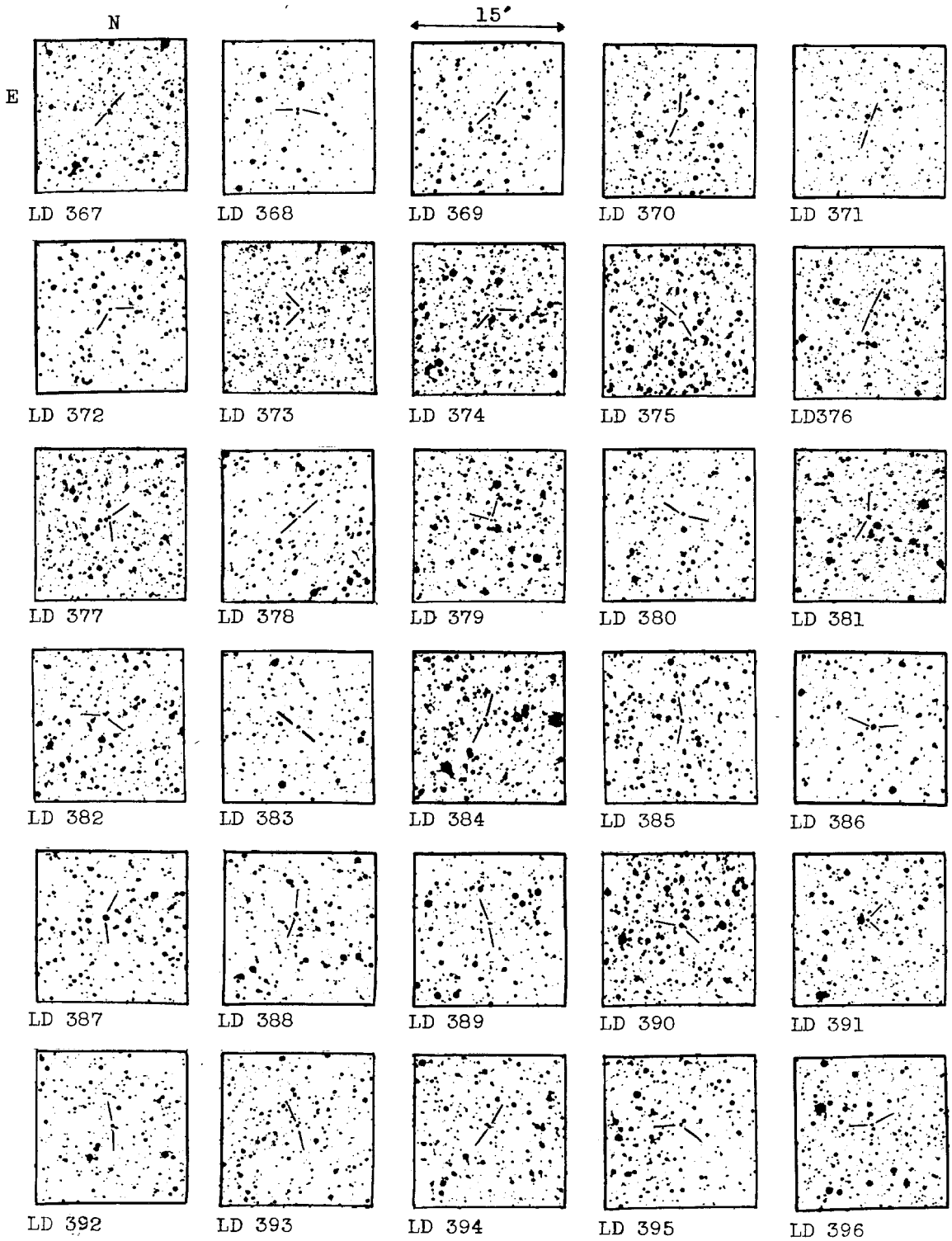
N
E
15′
LD 367
LD 368
LD 369
LD 370
LD 371
LD 372
LD 373
LD 374
LD 375
LD376
LD 377
LD 378
LD 379
LD 380
LD 381
LD 382
LD 383
LD 384
LD 385
LD 386
LD 387
LD 388
LD 389
LD 390
LD 391
LD 392
LD 393
LD 394
LD 395
LD 396

Figure 2.

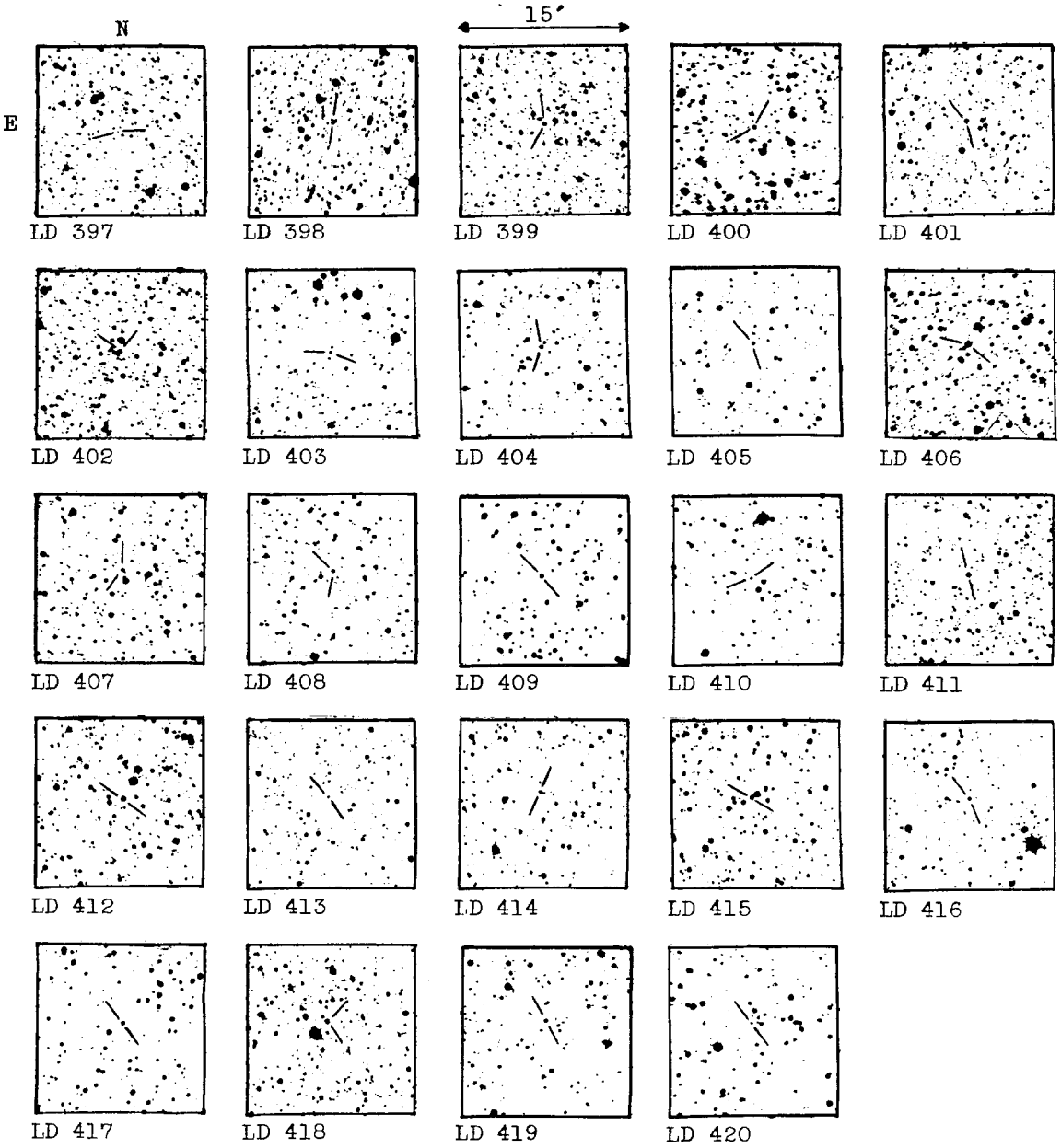
15′
N
E
LD 397
LD 398
LD 399
LD 400
LD 401
LD 402
LD 403
LD 404
LD 405
LD 406
LD 407
LD 408
LD 409
LD 410
LD 411
LD 412
LD 413
LD 414
LD 415
LD 416
LD 417
LD 418
LD 419
LD 420

Figure 3.

The elements of variation are collected in Table 2. An asterisk by the star name indicates a note following the table. The light curve determinations are based usually on fifty magnitude estimates for each star. From these the magnitude range, provisional variability type, epoch of maximum, and period have been determined. The column '$b-r$' shows star colors from USNO–A2.0; these are not well calibrated to any standard system, but serve to indicate in a qualitative way the sorts of stars involved.

Finder charts (Figs. 1–3) are shown both for stars in the present list and the previous one (LD 342–366), which were inadvertently omitted from Dahlmark (2000).

I would like to thank Gerhard Klaus (Grenchen, Switzerland), who has provided me for many years with finding charts and magnitudes from the GSC for each of the variables. Brian Skiff (Lowell Observatory) has checked the coordinates and identifications, and has prepared the material for publication. All the catalogue searches except in GSC-2.2 were done using the CDS-Strasbourg VizieR utility. Preliminary designations for suspect variables were identified in Taichi Kato's handy 'newvar' list (Kato 2001).

References:

Collins, M., 2000, http://www.demon.co.uk/astronomer/mikes_variables.html
Dahlmark, L., 2000, *IBVS*, No. 4898
Gray, W., 1999, http://www.projectpluto.com/gsc_act.htm
Haseda, K., 1999, http://www.kusastro.kyoto-u.ac.jp/vsnet/Mail/obs20000/msg00273.html
Høg, E., Fabricius, C., Makarov, V. V., Bastian, U., Schwekendiek, P., Wicenec, A., Urban, S. E., Corbin, T., and Wycoff, G., 2000, *Astron. Astrophys.*, **357**, 367
Kato, T., 2001, ftp://ftp.kusastro.kyoto-u.ac.jp/pub/vsnet/others/newvar.cat
Kazarovets, E. V., Samus, N. N., and Durlevich, O. V., 2001, *IBVS*, No. 5135
Lasker, B. M., Sturch, C. R., McLean, B. J., Russell, J. L., Jenkner, H., and Shara, M. M., 1990, *Astron. J.*, **99**, 2019
Lee, O. J., Baldwin, R. J., Hamlin, D. W., Bartlett, T. J., Gore, G. D., and Baldwin, T. J., 1947, *Ann. Dearborn Obs.*, **5**, 1
Monet, D., Bird, A., Canzian, B., Harris, H., Reid, N., Rhodes, A., Sell, S., Ables, H., Dahn, C., Guetter, H., Henden, A., Leggett, S., Levison, H., Luginbuhl, C., Martini, J., Monet, A., Pier, J., Riepe, B., Stone, R., Vrba, F., Walker, R., 1998, USNO–A2.0; U.S. Naval Observatory, Washington DC; see also http://www.nofs.navy.mil
Price, S. D., Egan, M. P., Carey, S. J., Mizuno, D. R., and Kuchar, T. A., 2001, *Astron. J.*, **121**, 2819
Skrutskie, M. F., 2000, http://www.ipac.caltech.edu/2mass
Stephenson, C. B., 1989, *Publ. Warner & Swasey Obs.*, **3**, 53
STScI, 2001, http://www-gsss.stsci.edu/support/data_access.htm
Yoshida, S., 2000a, http://www.kusastro.kyoto-u.ac.jp/vsnet/Mail/vsnet-newvar/msg00116.html
Yoshida, S., 2000b, http://www.kusastro.kyoto-u.ac.jp/vsnet/Mail/vsnet-newvar/msg00516.html
Yoshida, S., 2000c, http://www.kusastro.kyoto-u.ac.jp/vsnet/Mail/vsnet-newvar/msg00622.html
Zemliannikova, S. V., 1986, *Perem. Zvezdy*, **22**, 359