Carbon Star Observing Program Atlas

Tom Heisey

A Publication of the Astronomical League

Astronomical League

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Acknowledgments

Patrick Chevalley deserves many thanks for his wonderful program Cartes du Ciel and for some help in getting it set to generate the charts in this atlas. This atlas was much easier with your program than any other system I tried. The icing on the cake is that Patrick makes it freely available for uses like this! https://www.ap-i.net/skychart//en/start

Many thanks to Dr. Aaron Clevenson for answering my many questions during a busy time of year. You got me started in the right direction and turned me loose!

Also, thanks to Richard Brown for reviewing my work and catching errors!

Finally, thanks to the folks of the South Plains Astronomy Club for being great friends and wonderful companions under the stars! This map is for you!

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4	VX And	7.8-9.3	C02
5	AQ And	6.9 – 8.6	C02, C04
6	NSV 15196	8.3 – 8.7	C04
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99	TX Psc	4.8 – 5.2	C03
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Introduction

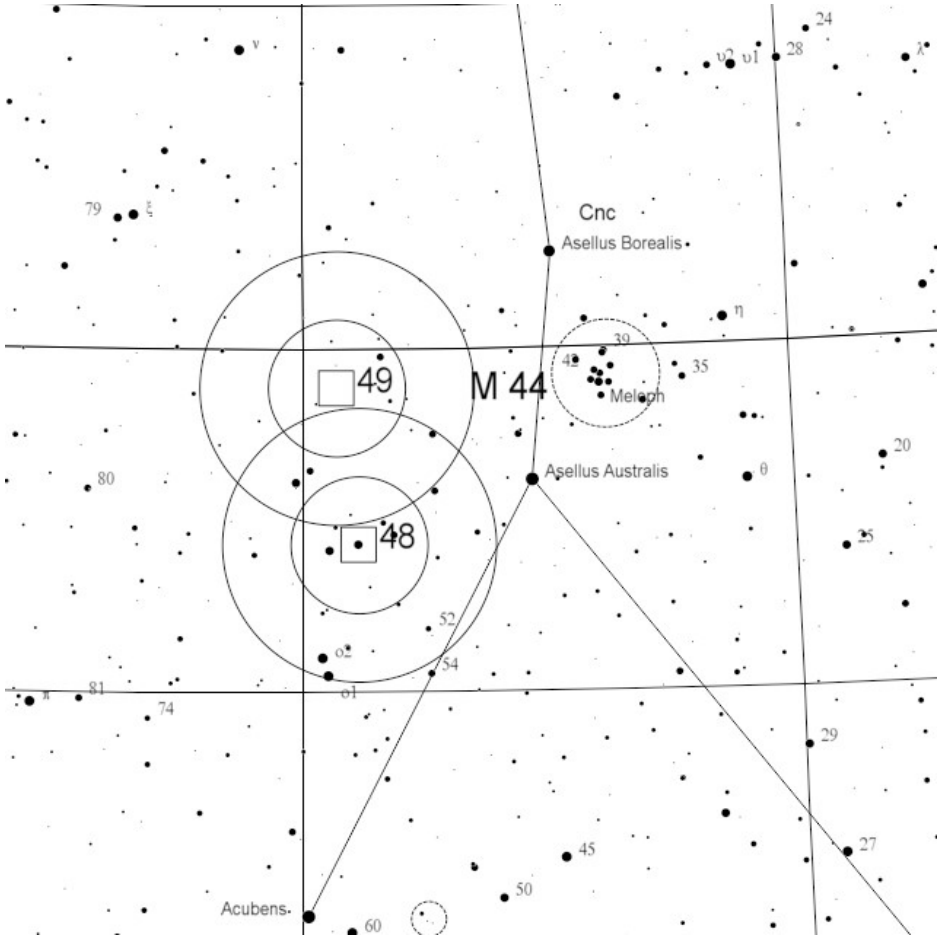
This atlas started as a quick aid for my astronomy club's campaign to complete the Carbon Star Observing Program, but I quickly realized that it would also make a nice aid for our public star parties. Since I was going to the effort to make atlas for my club, I decided that other clubs could benefit from it as well.

If you are reading this and you're not an Astronomical League member, please visit our site to learn who we are and the advantages of membership.

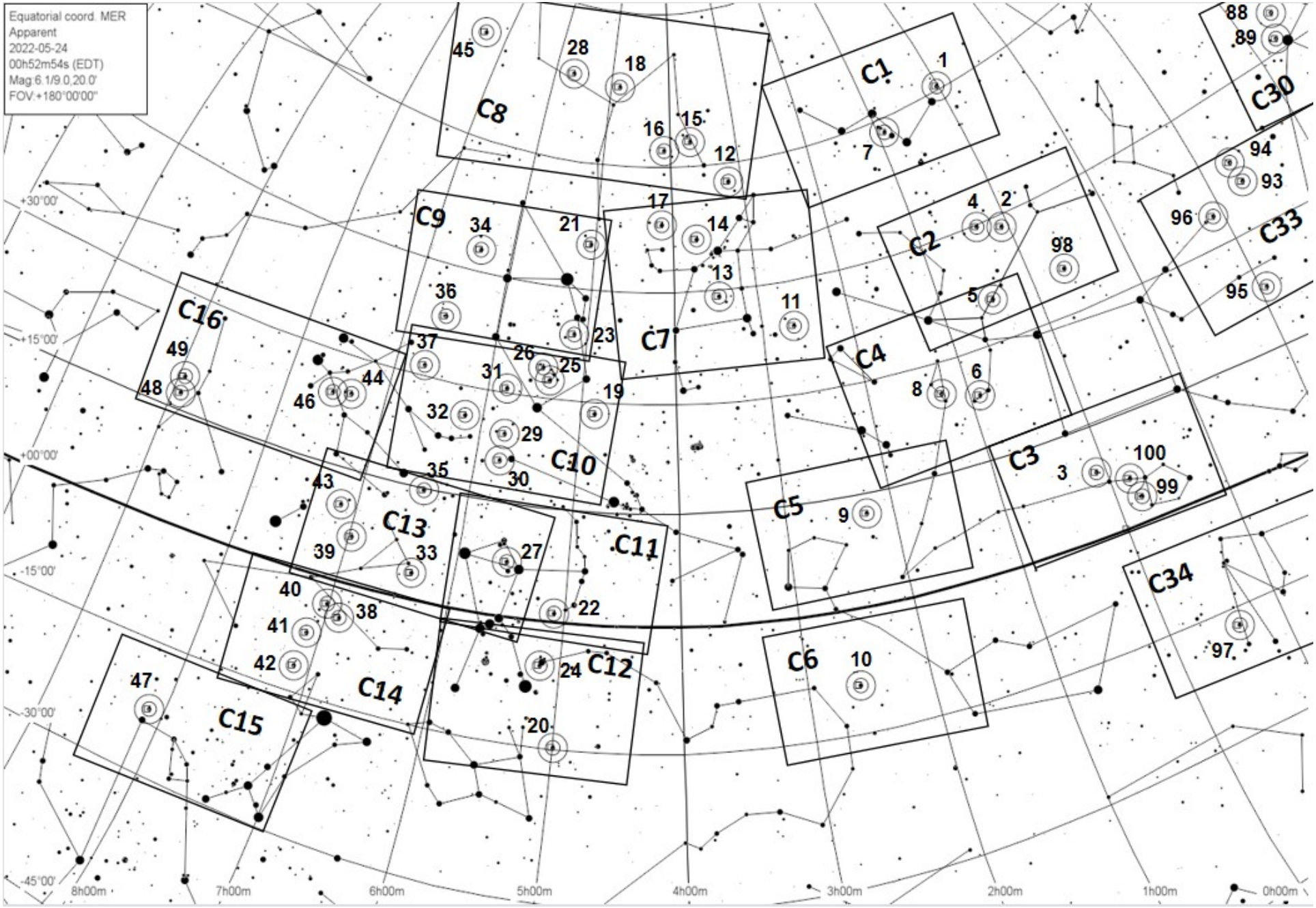
About the Charts

- The Charts were generated with Cartes du Ciel (Sky Charts)
- All charts are north up, visual orientation:
  - Overview charts are approximately 180° field of view.
  - Main charts are 30° field of view and:
    - Has a width of 2 & 3 hours RA.
    - Covers between 1 and 10 carbon stars
- All objects are marked with:
  - A program number from 1 to 100.
  - A 30’ square
  - 2° and 5° finder circles
  - Paired objects share a single set of finder circles.
- Some charts have a large amount of overlap, so many objects appear on more than one chart.

NOTE: A few of the program stars, like number 49 at right do not show on the chart. The 30’ square marks the spot.



A small section of Chart 16



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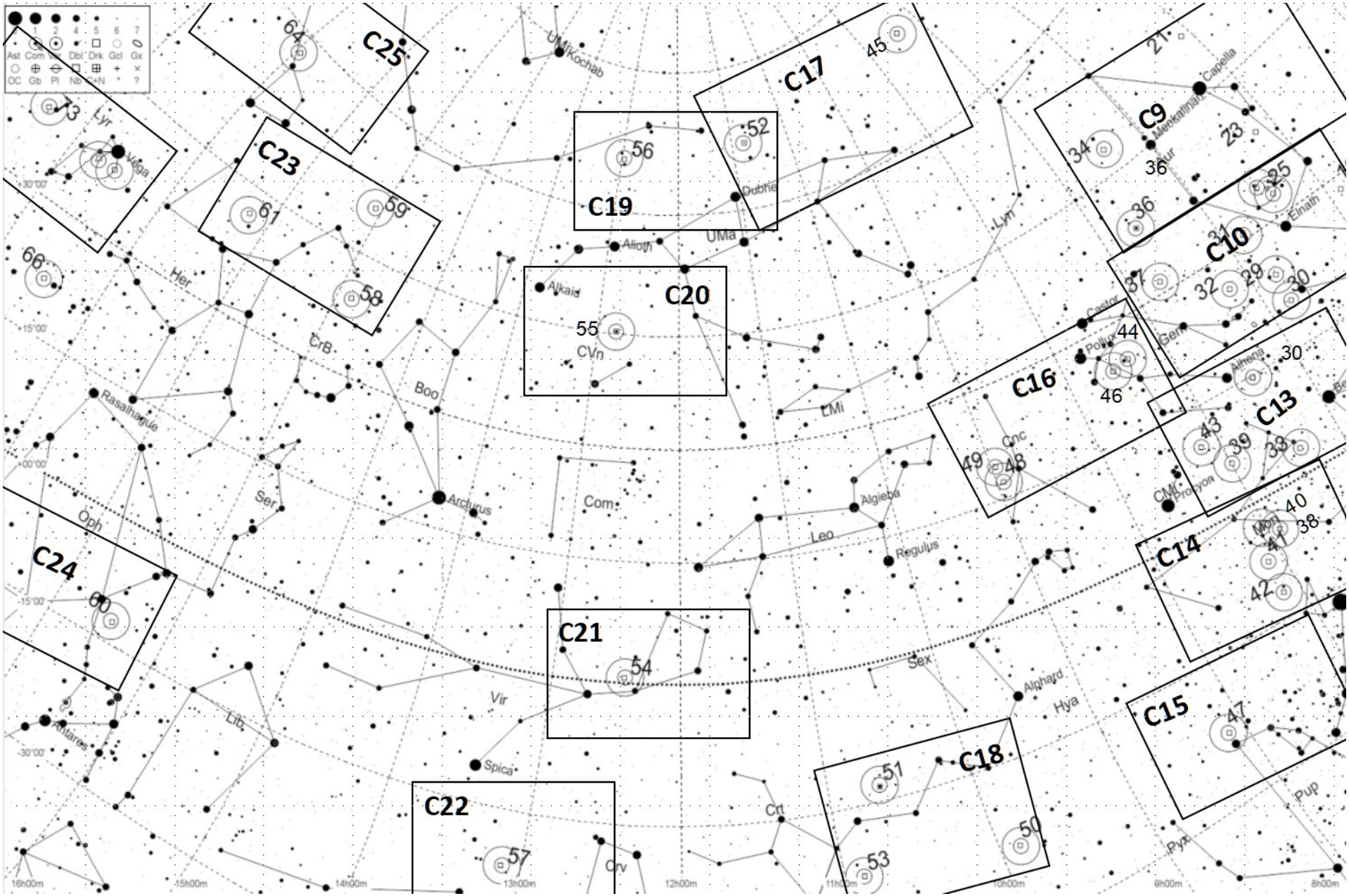

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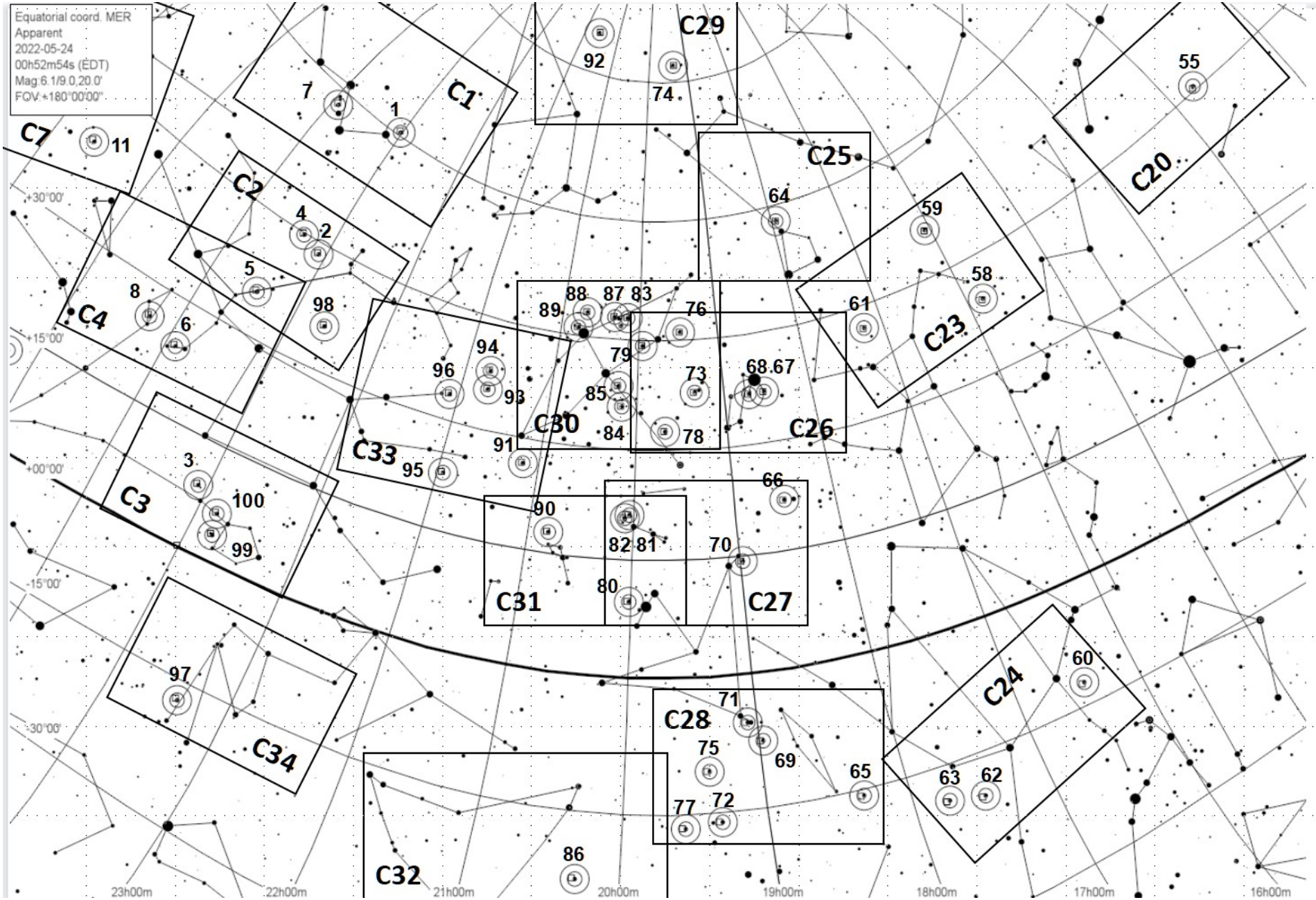

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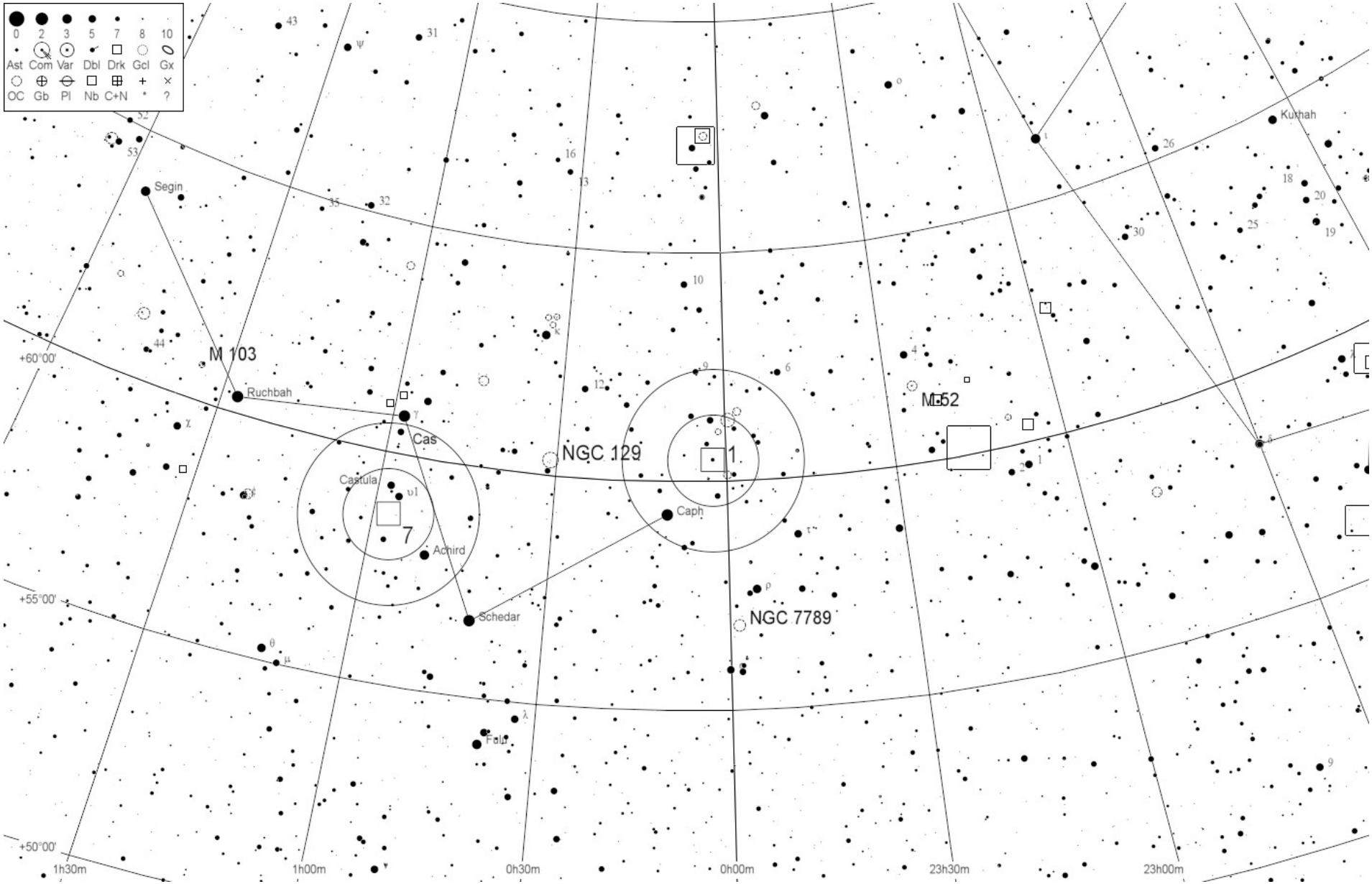

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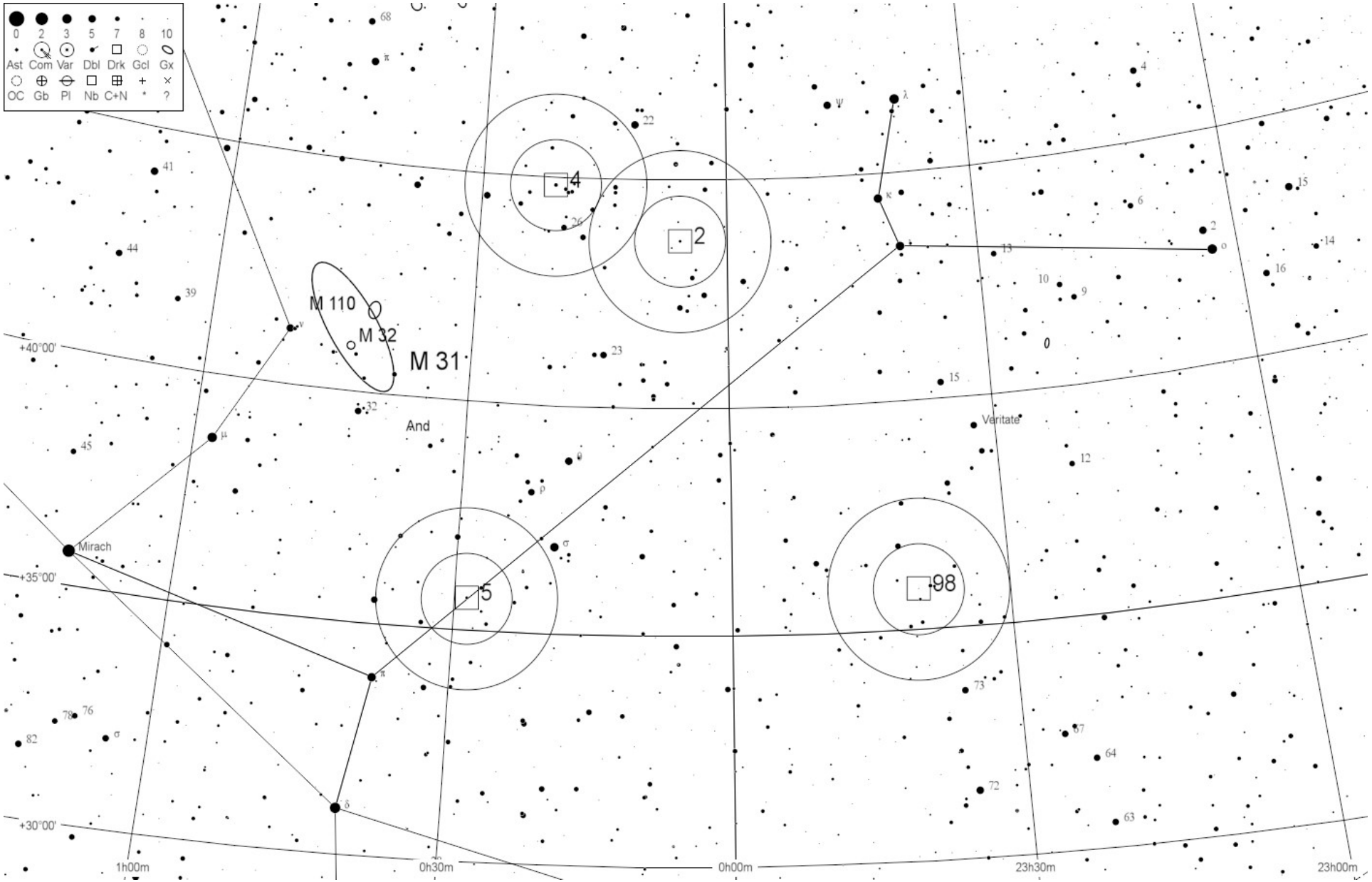

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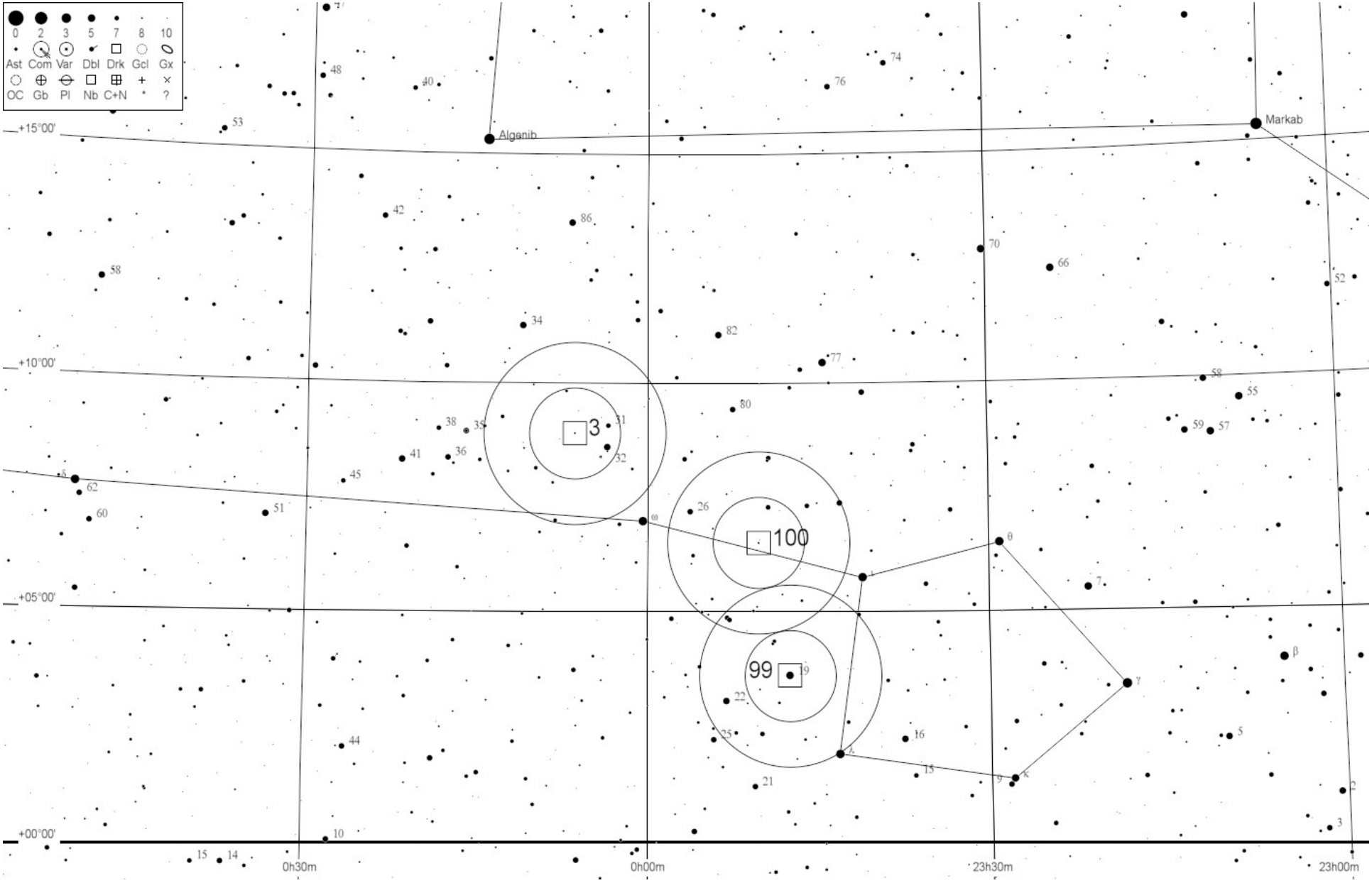
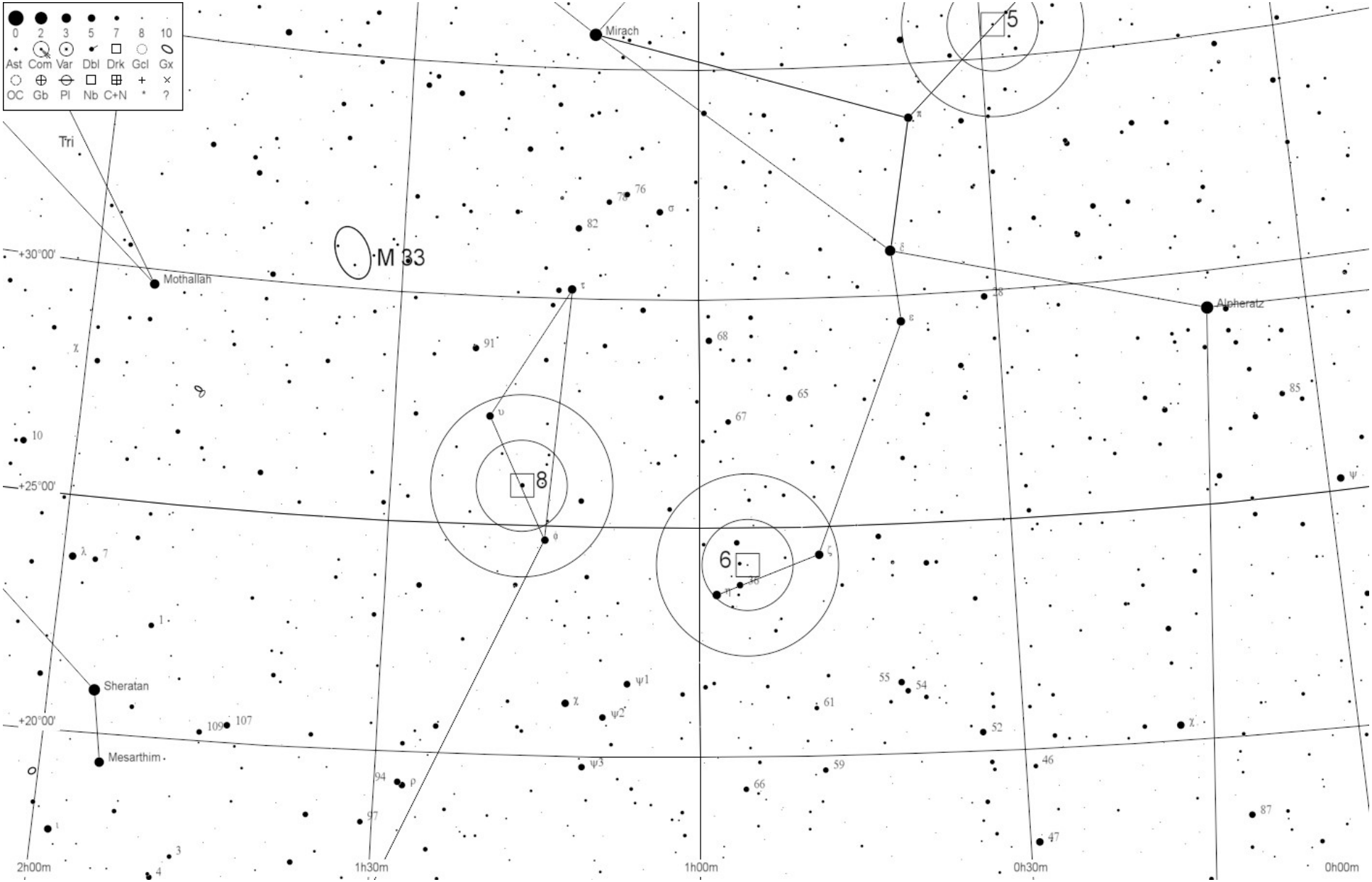


Chart 3: RA 0h - Pisces



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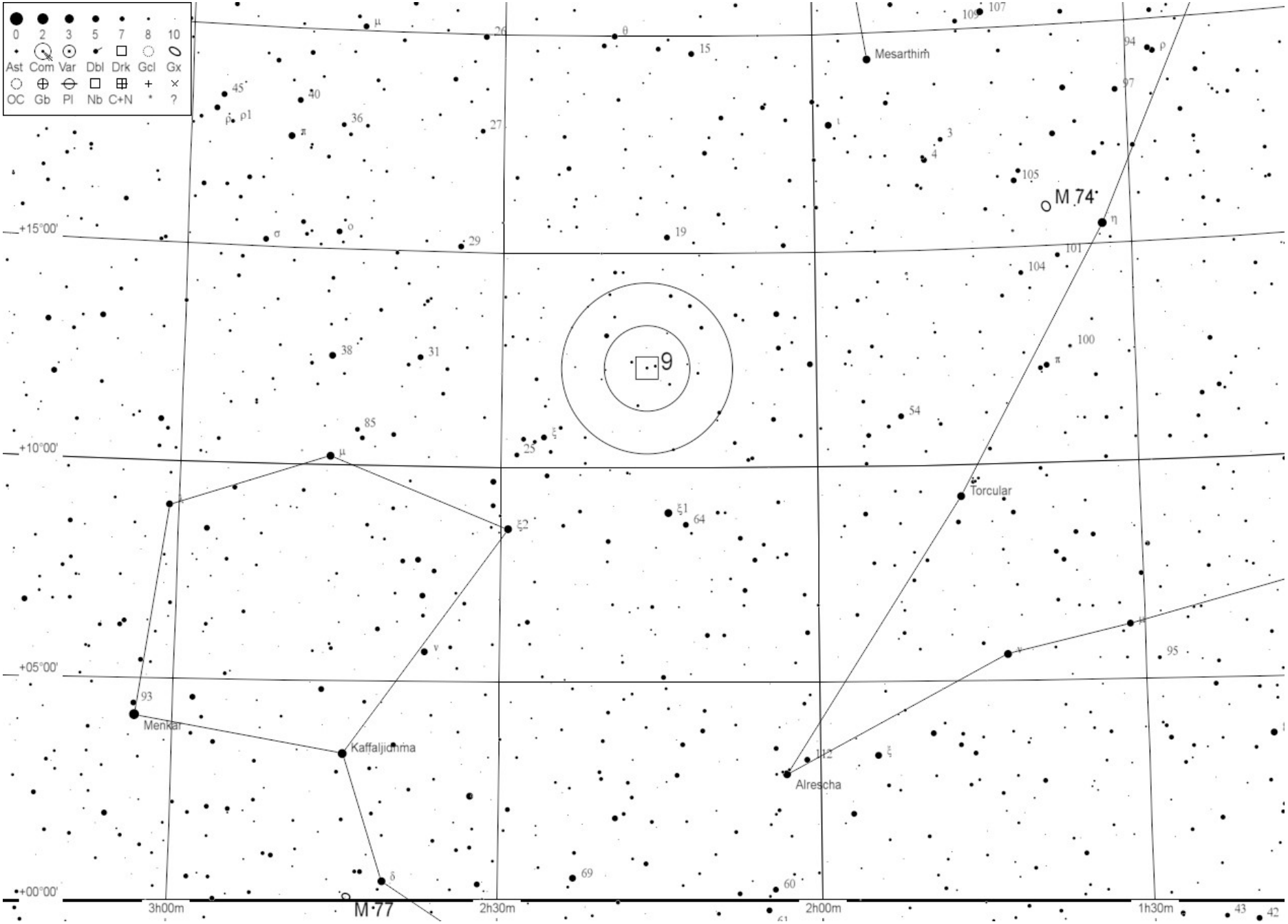

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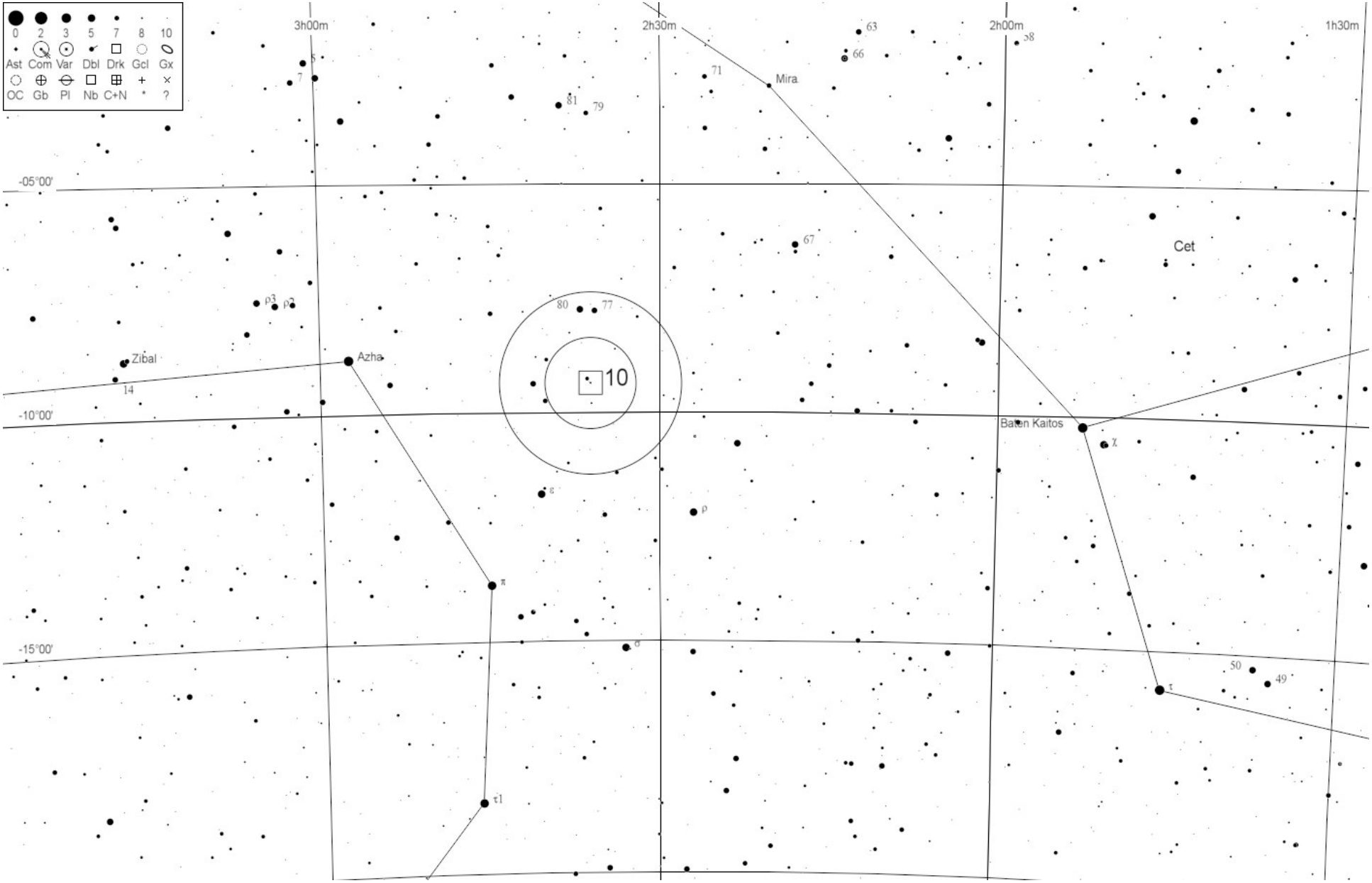

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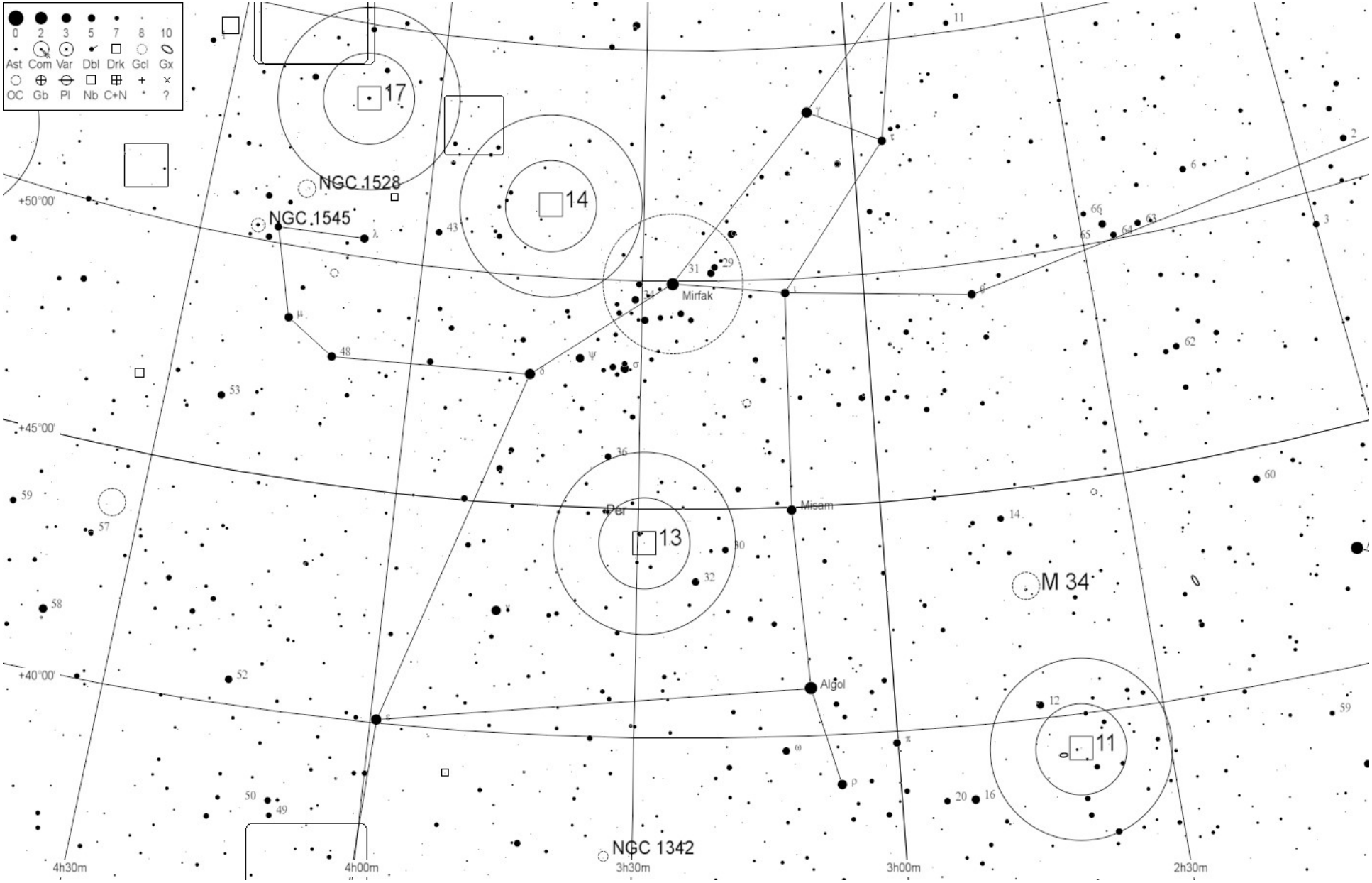

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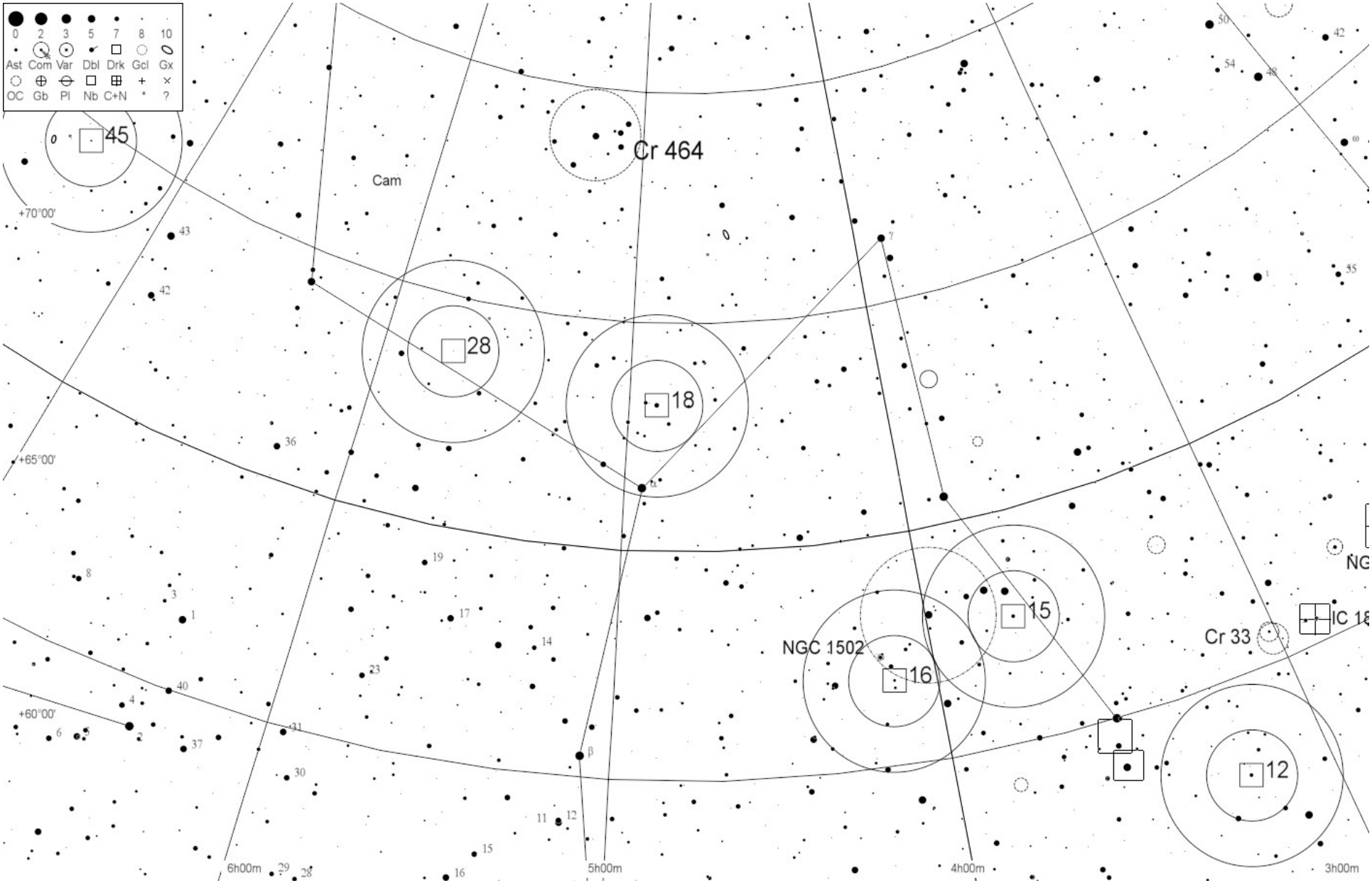

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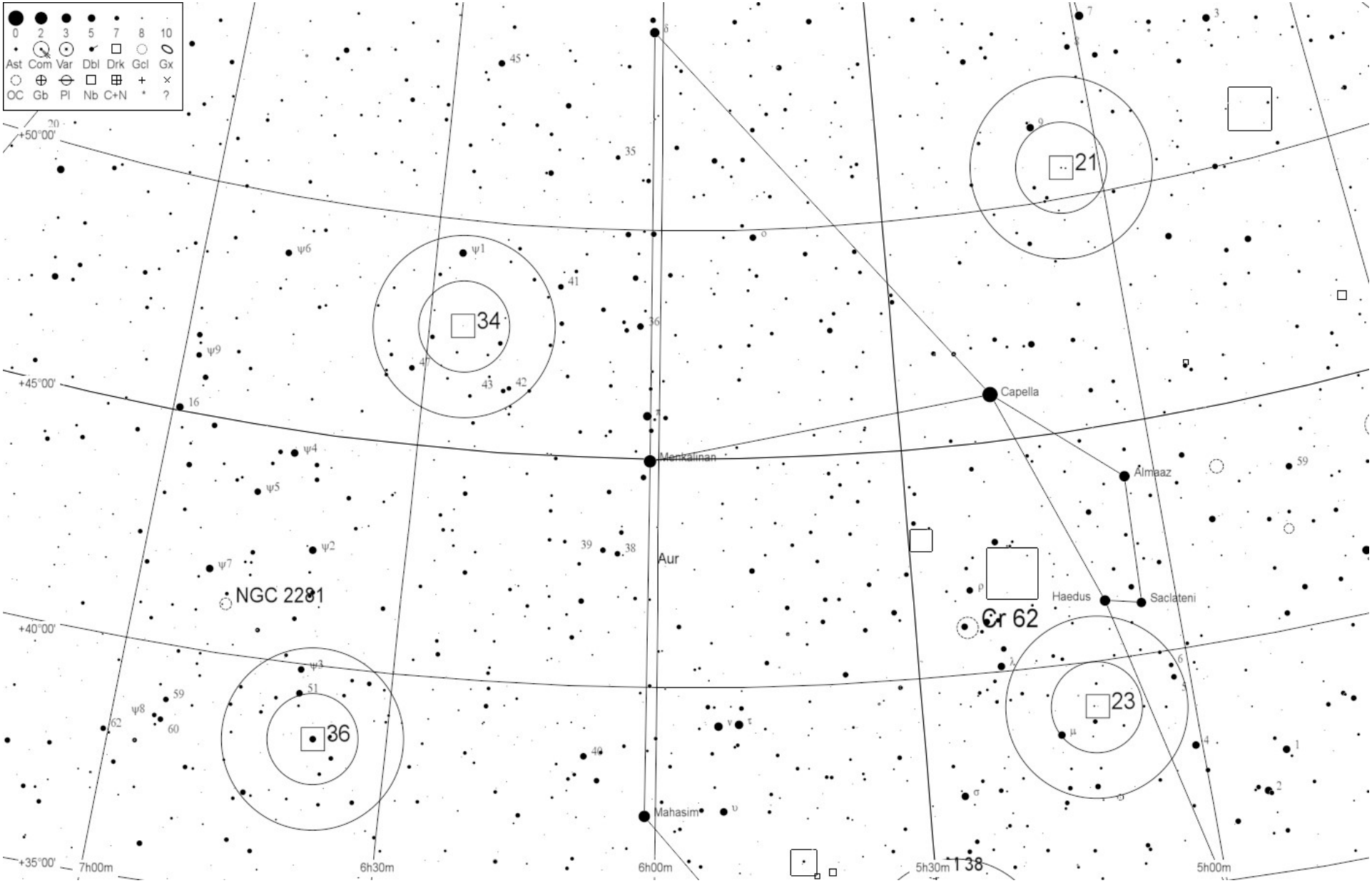

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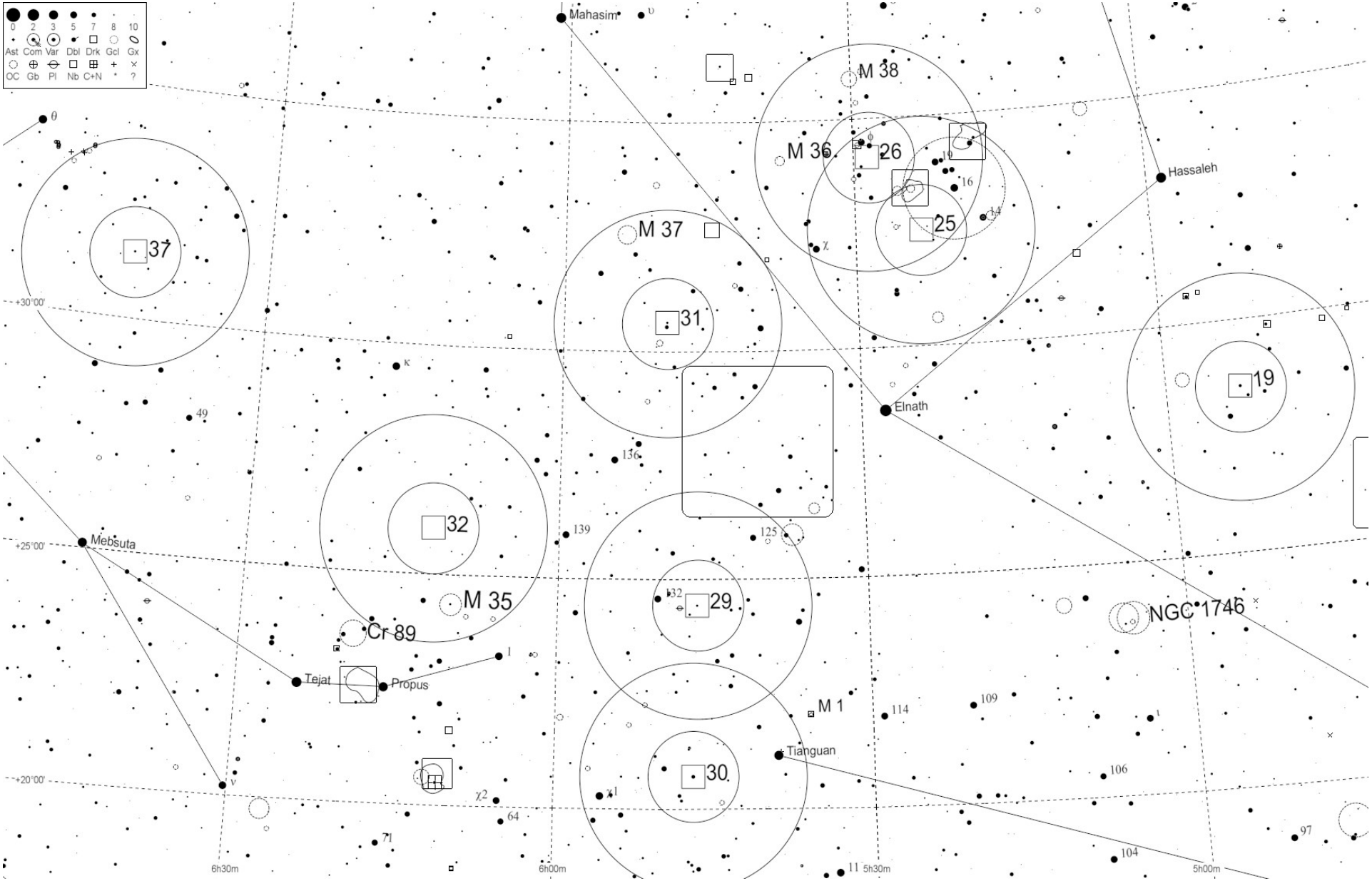

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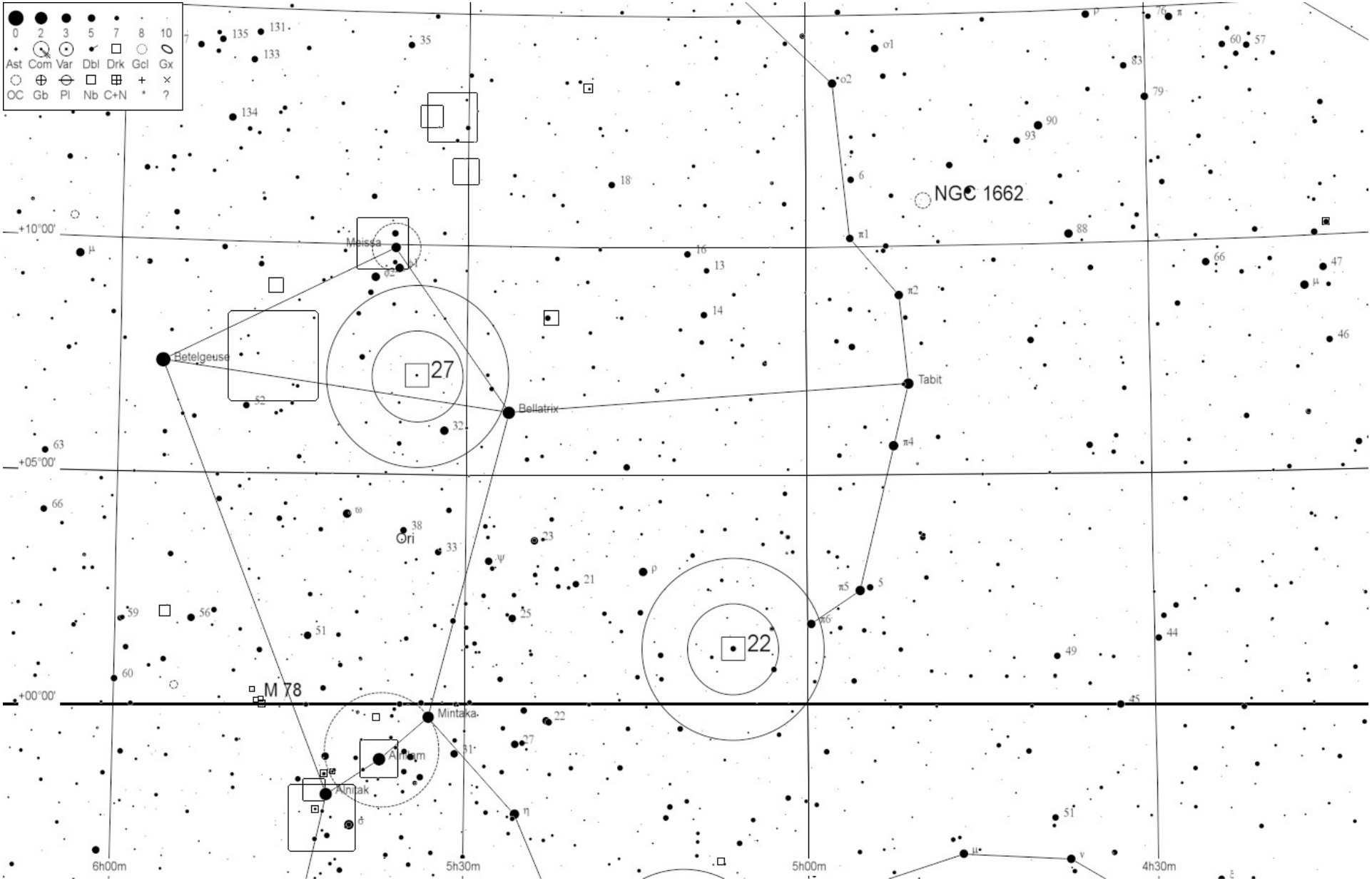

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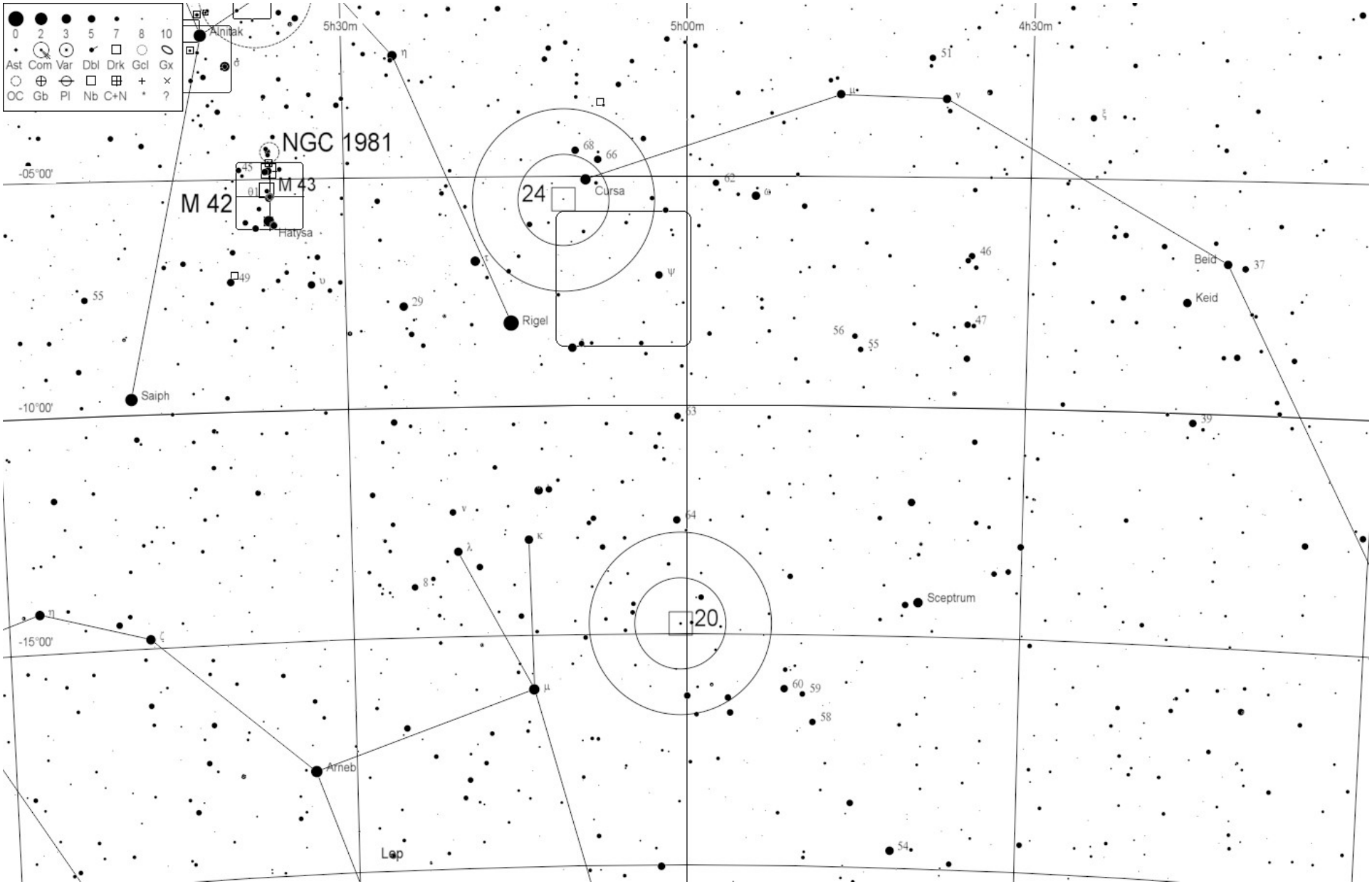

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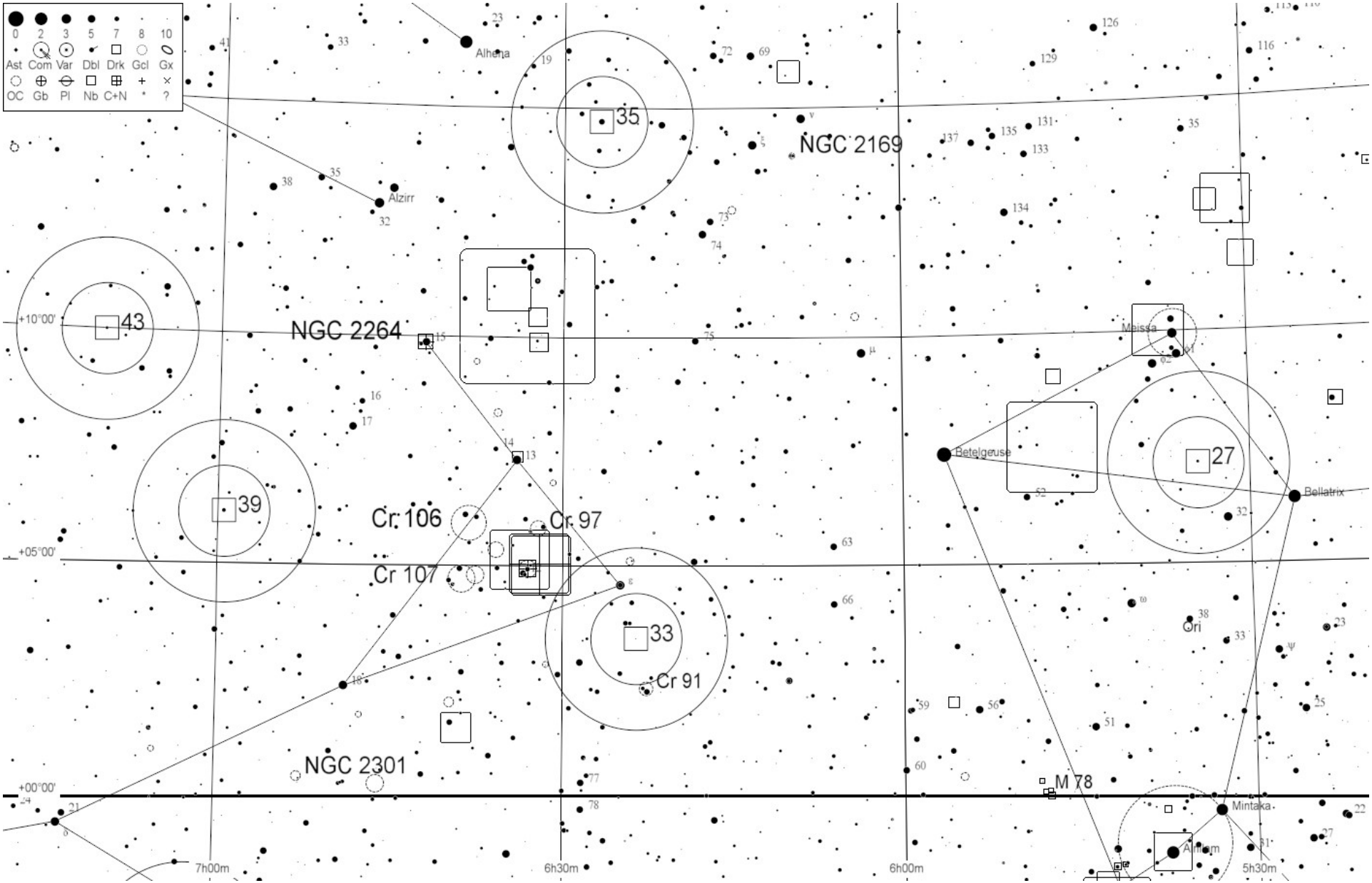

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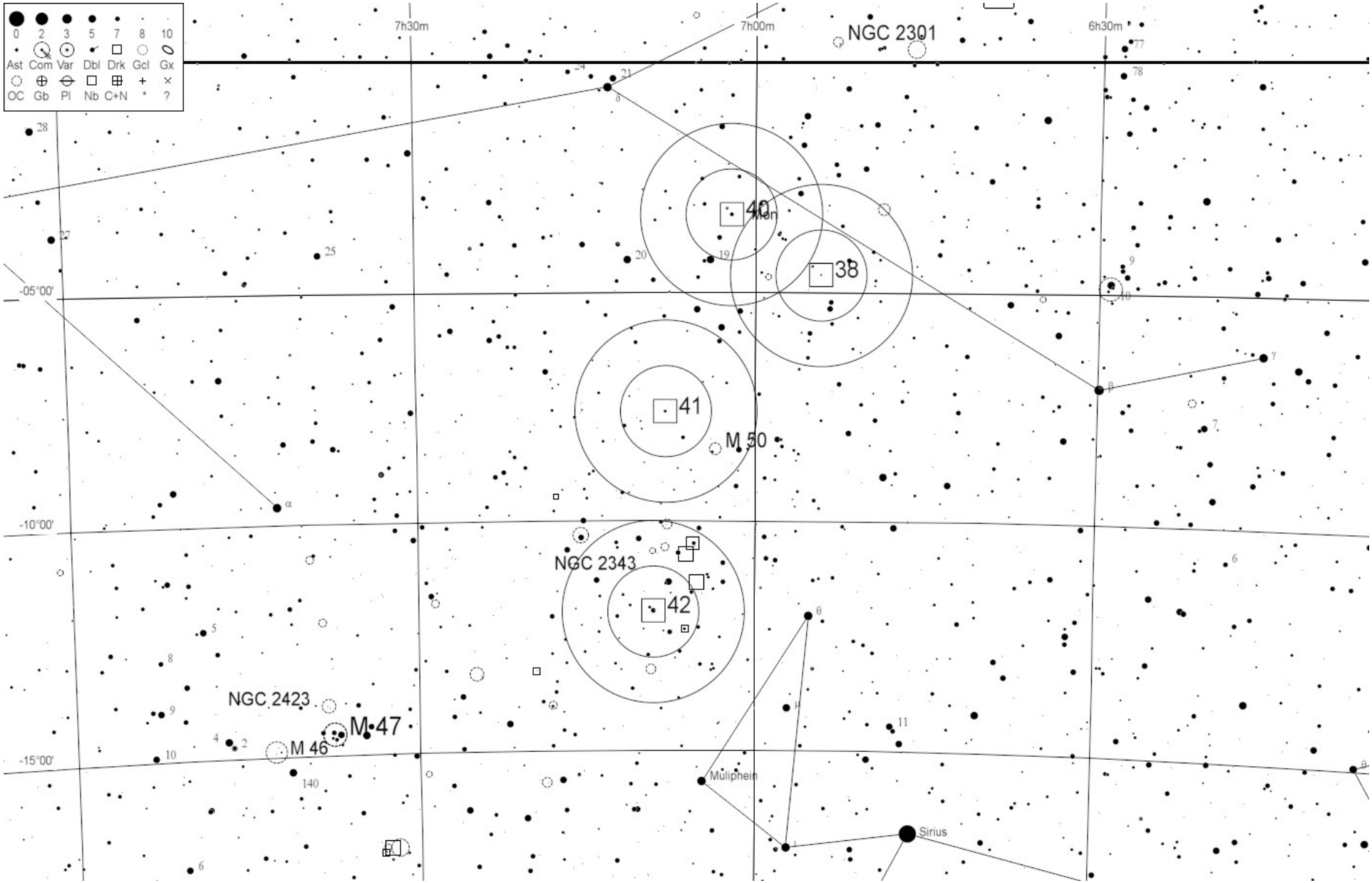

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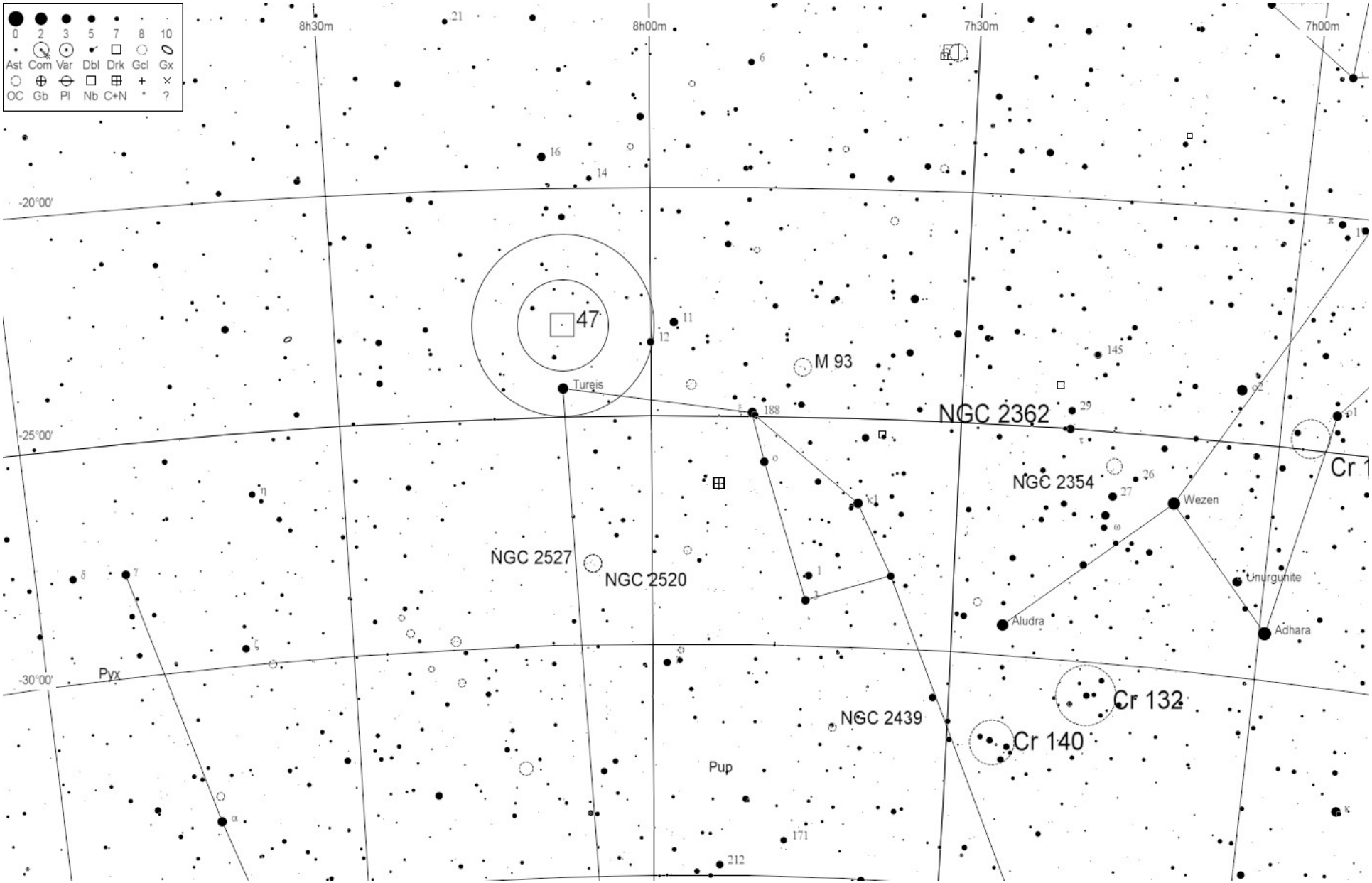

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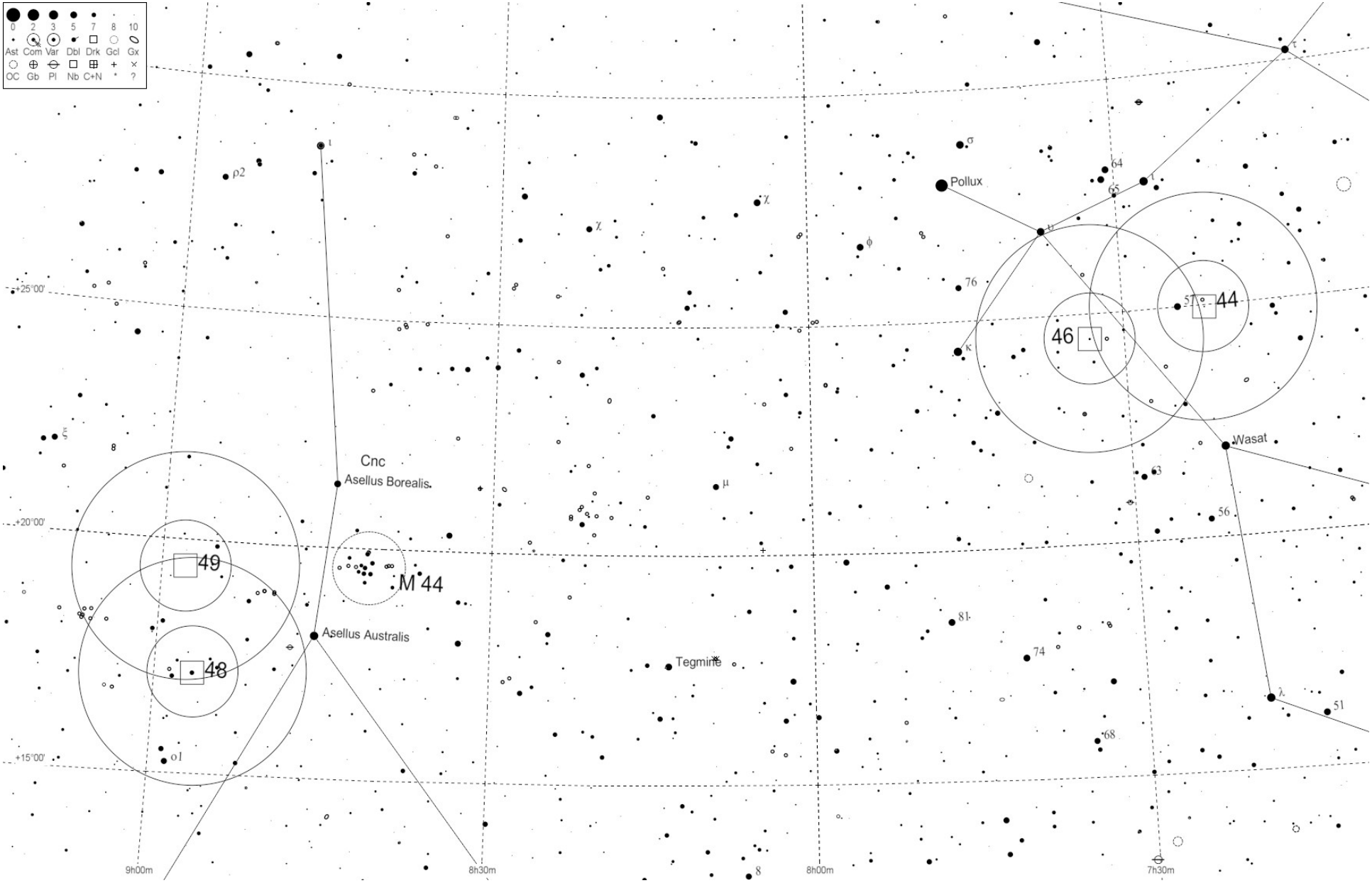

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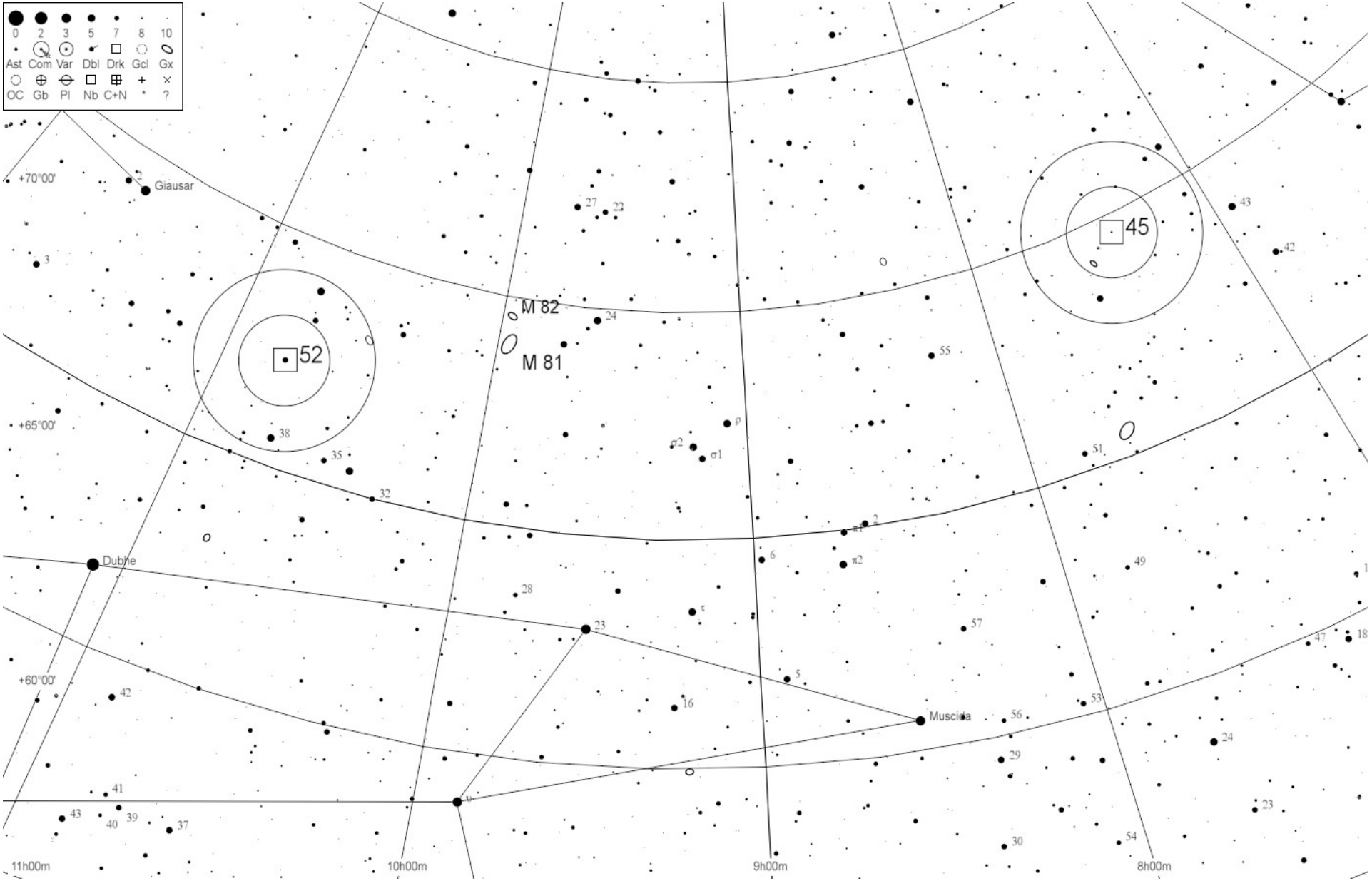

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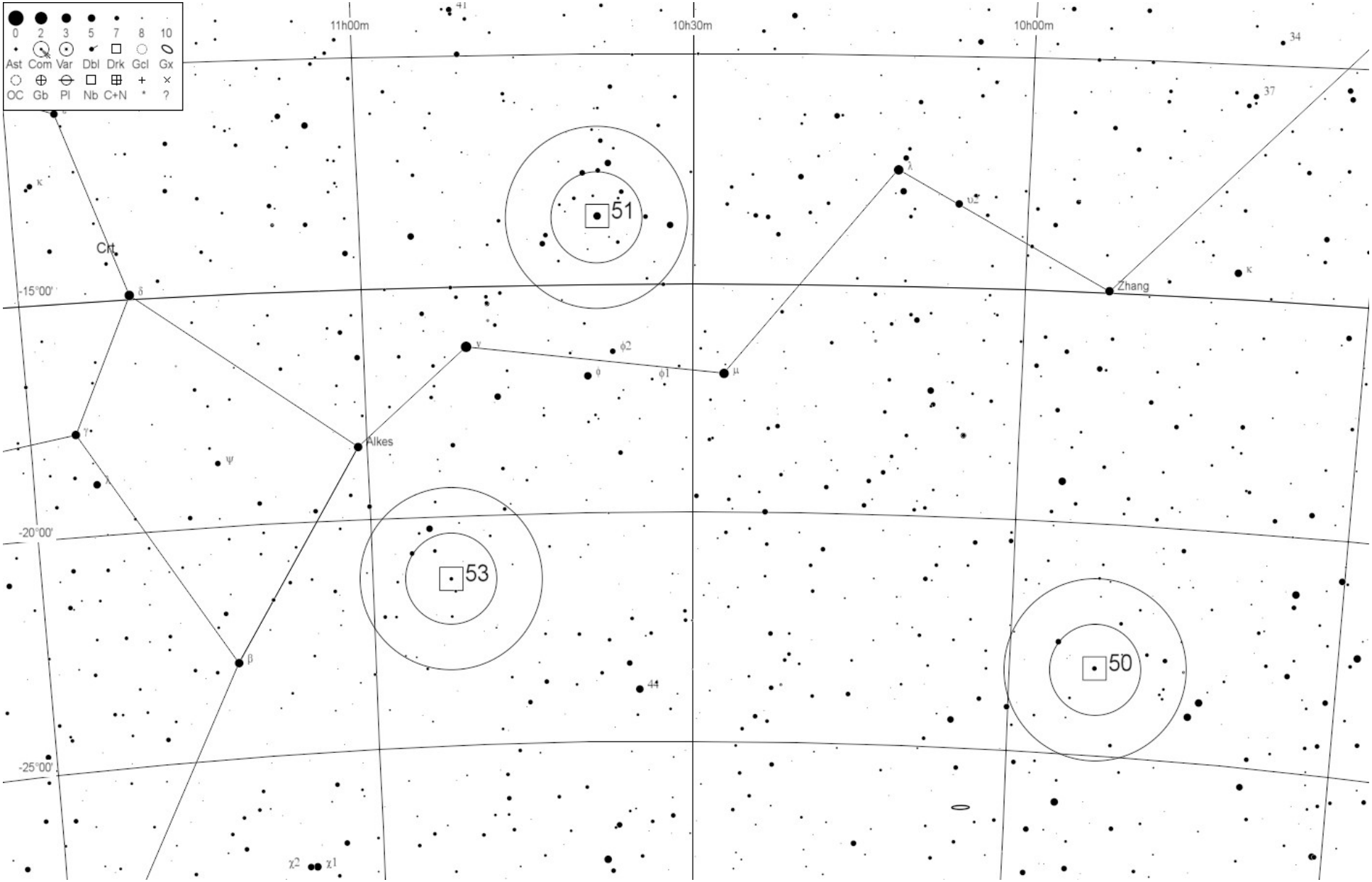

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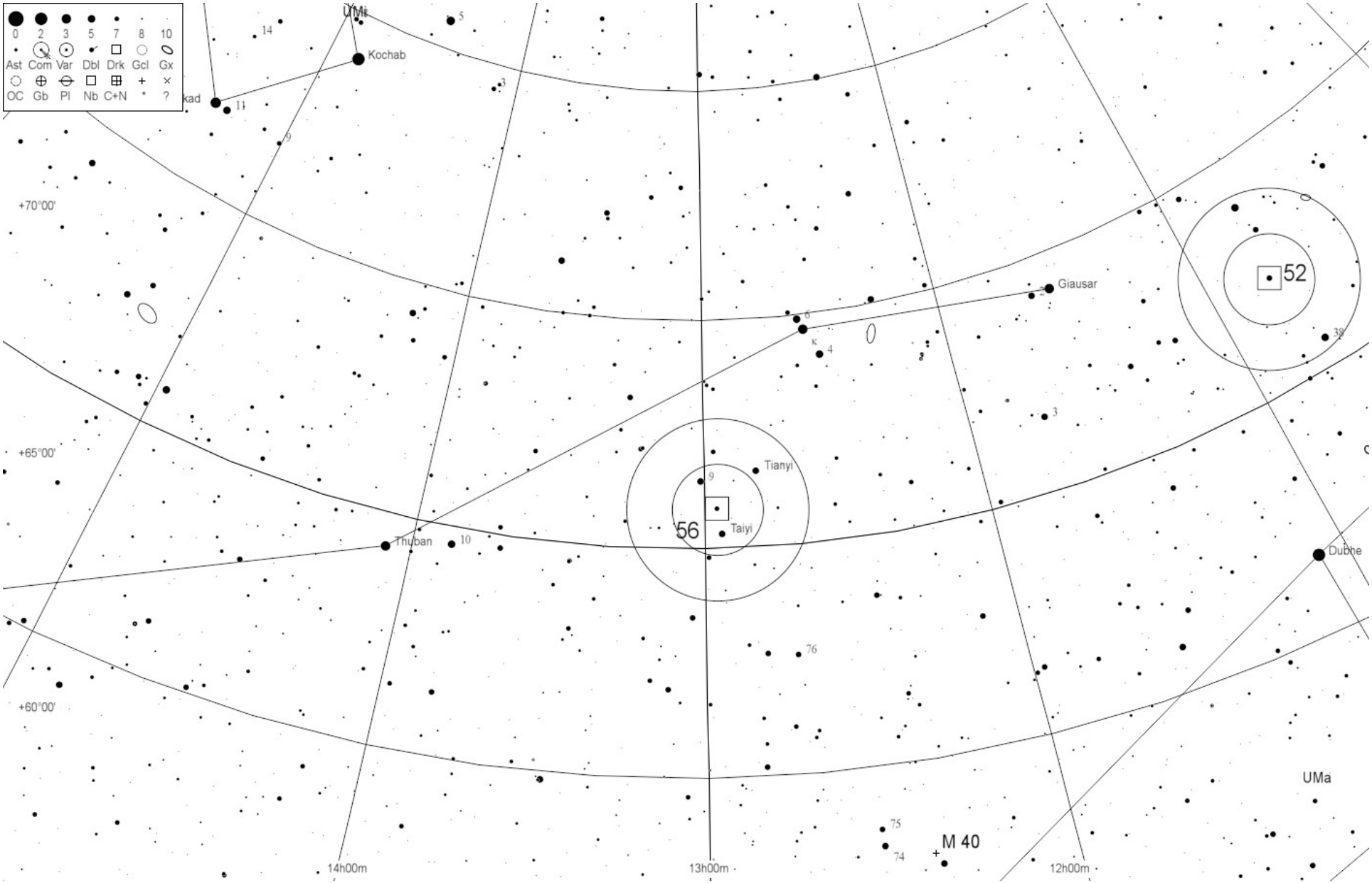

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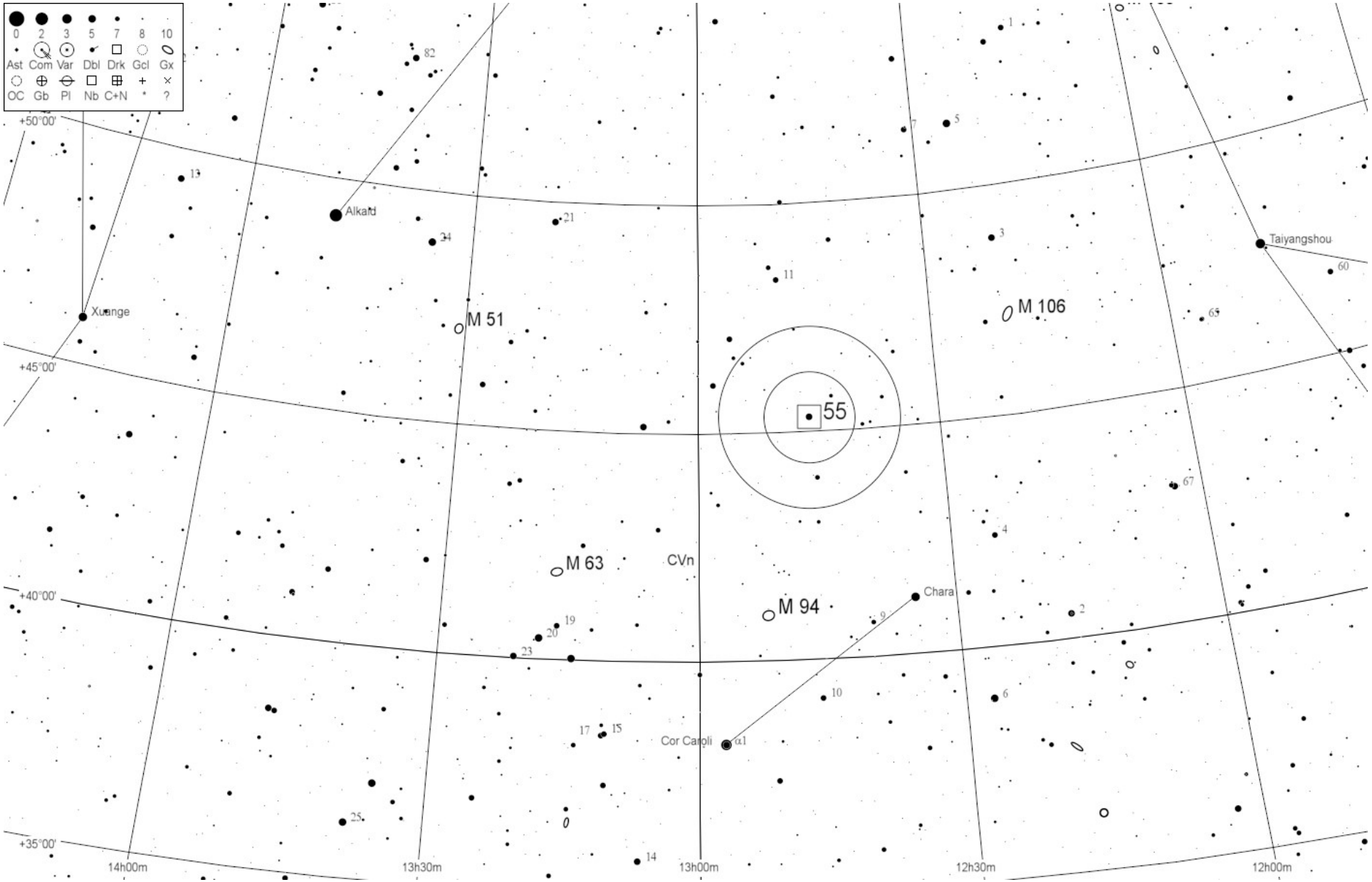


Chart 20: RA 13h - Canes Venatici

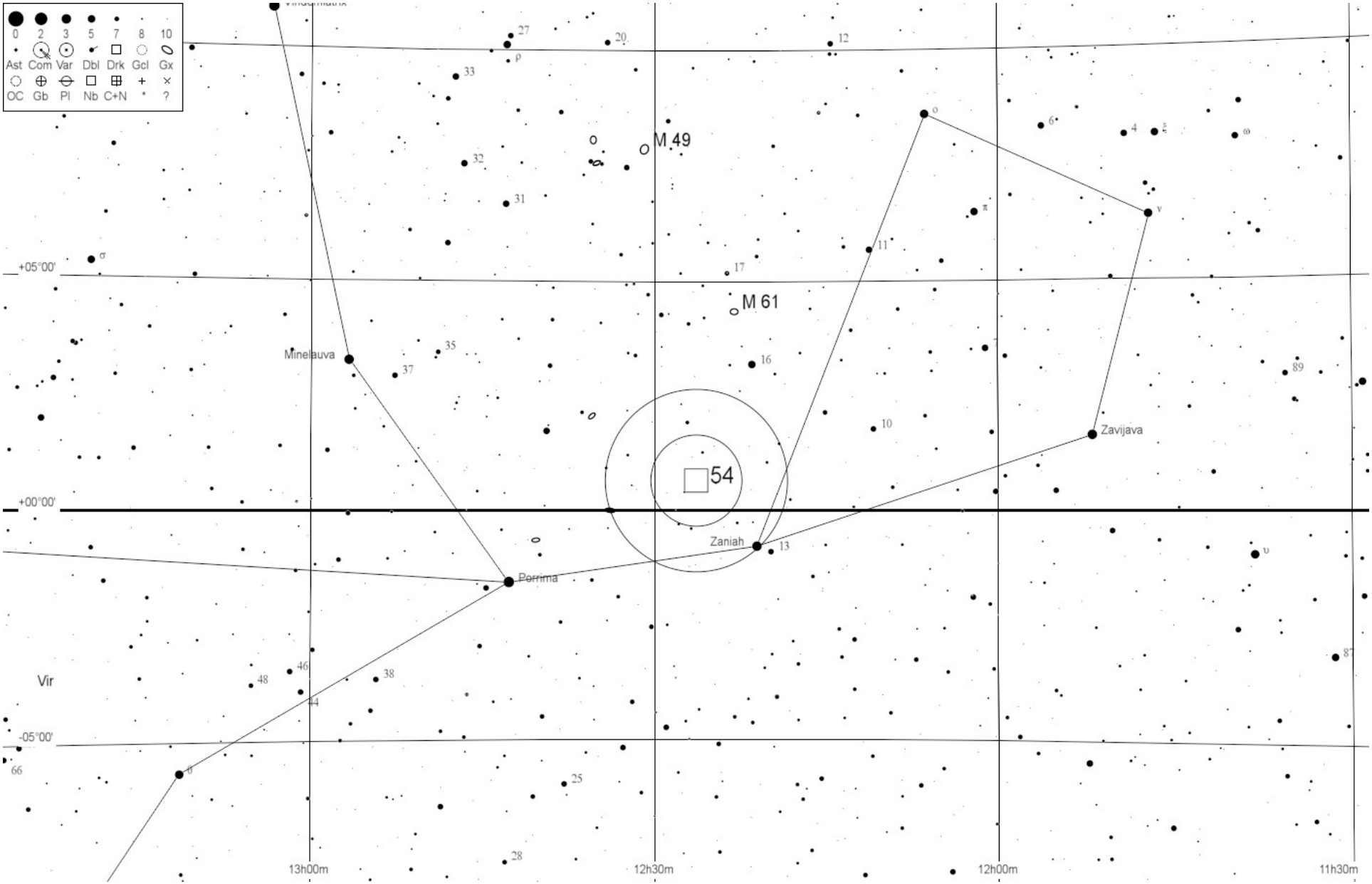


Chart 21: RA 12h30m - Virgo

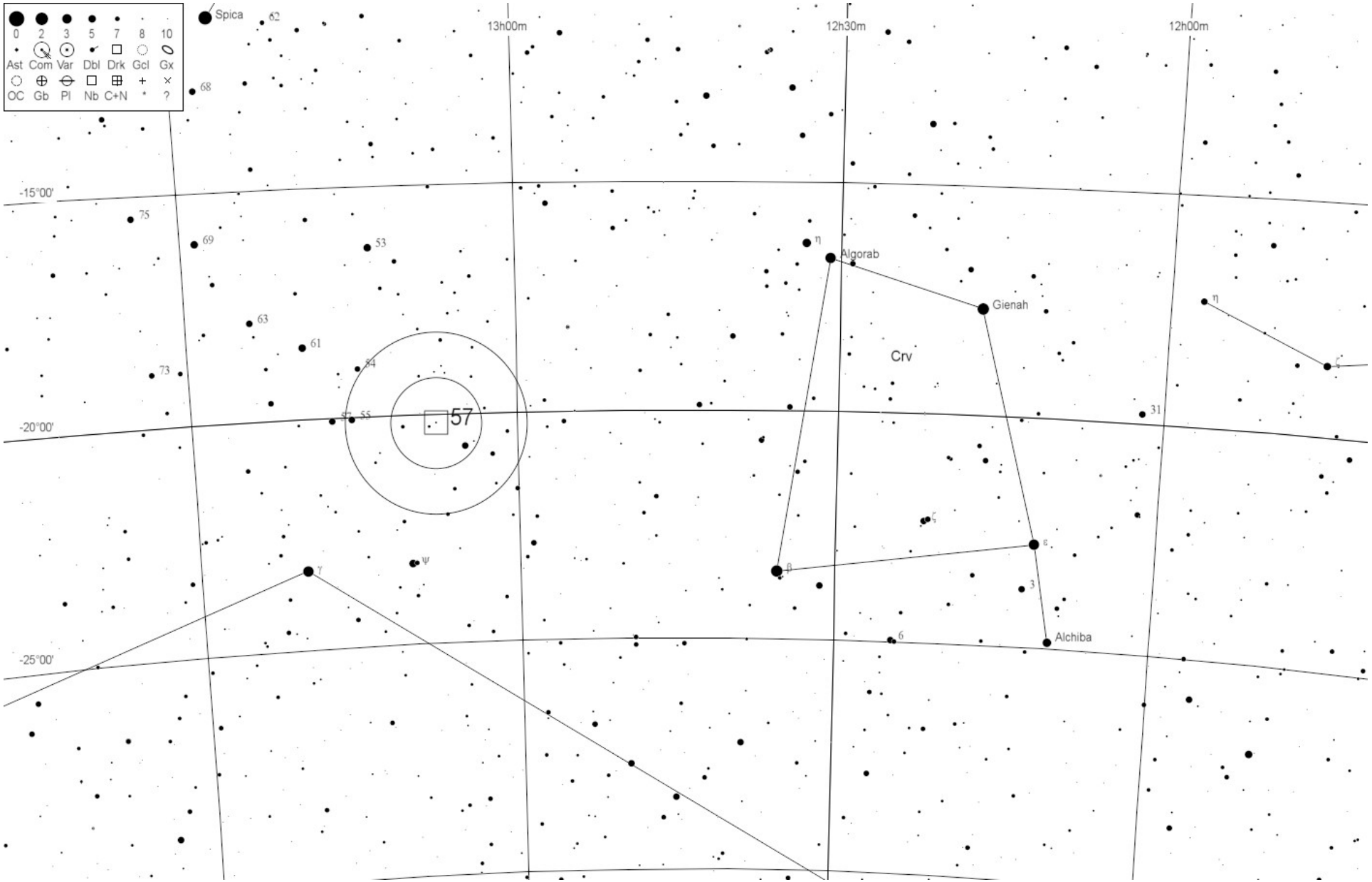
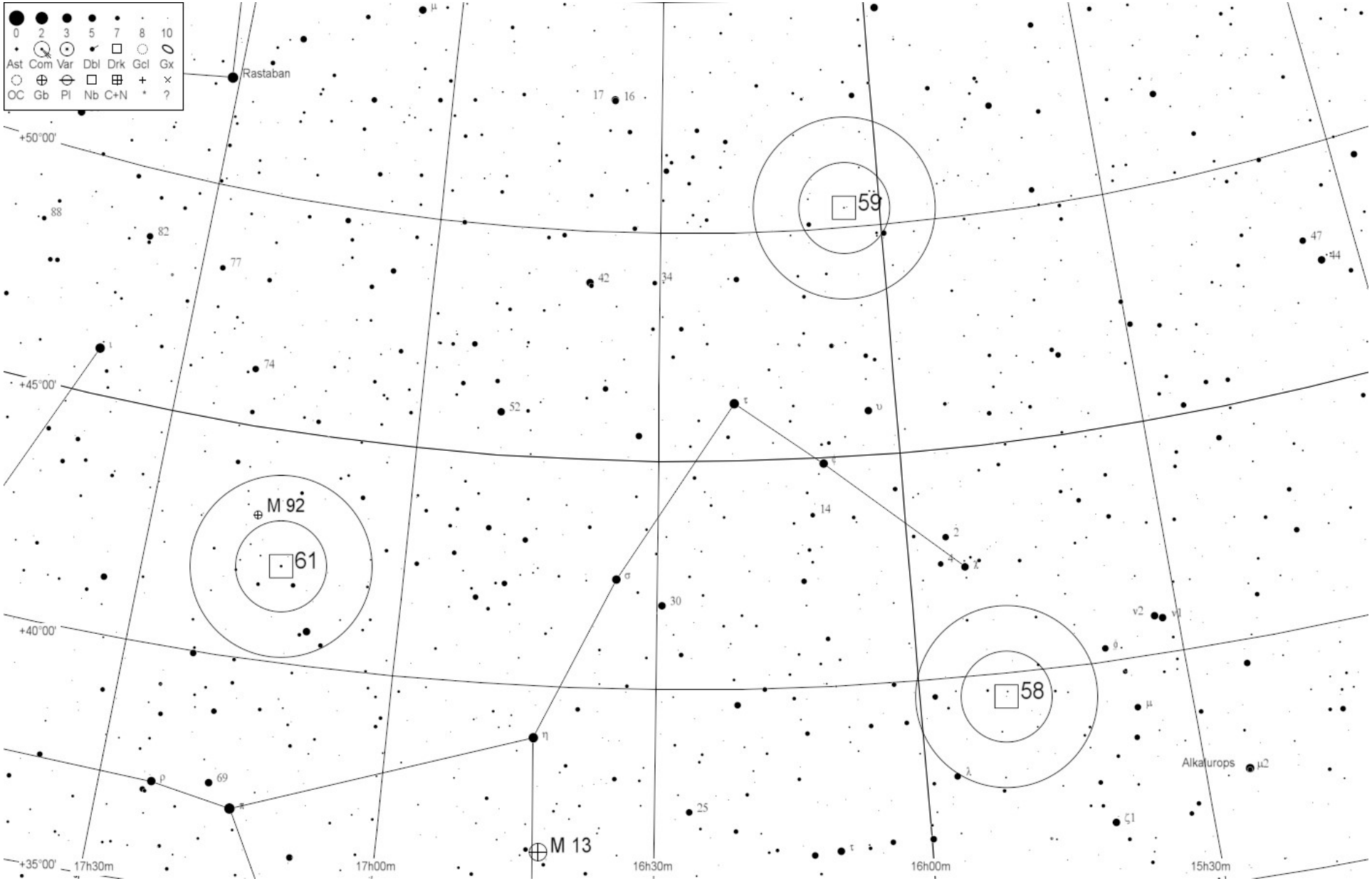


Chart 22: RA 12h30m - Virgo



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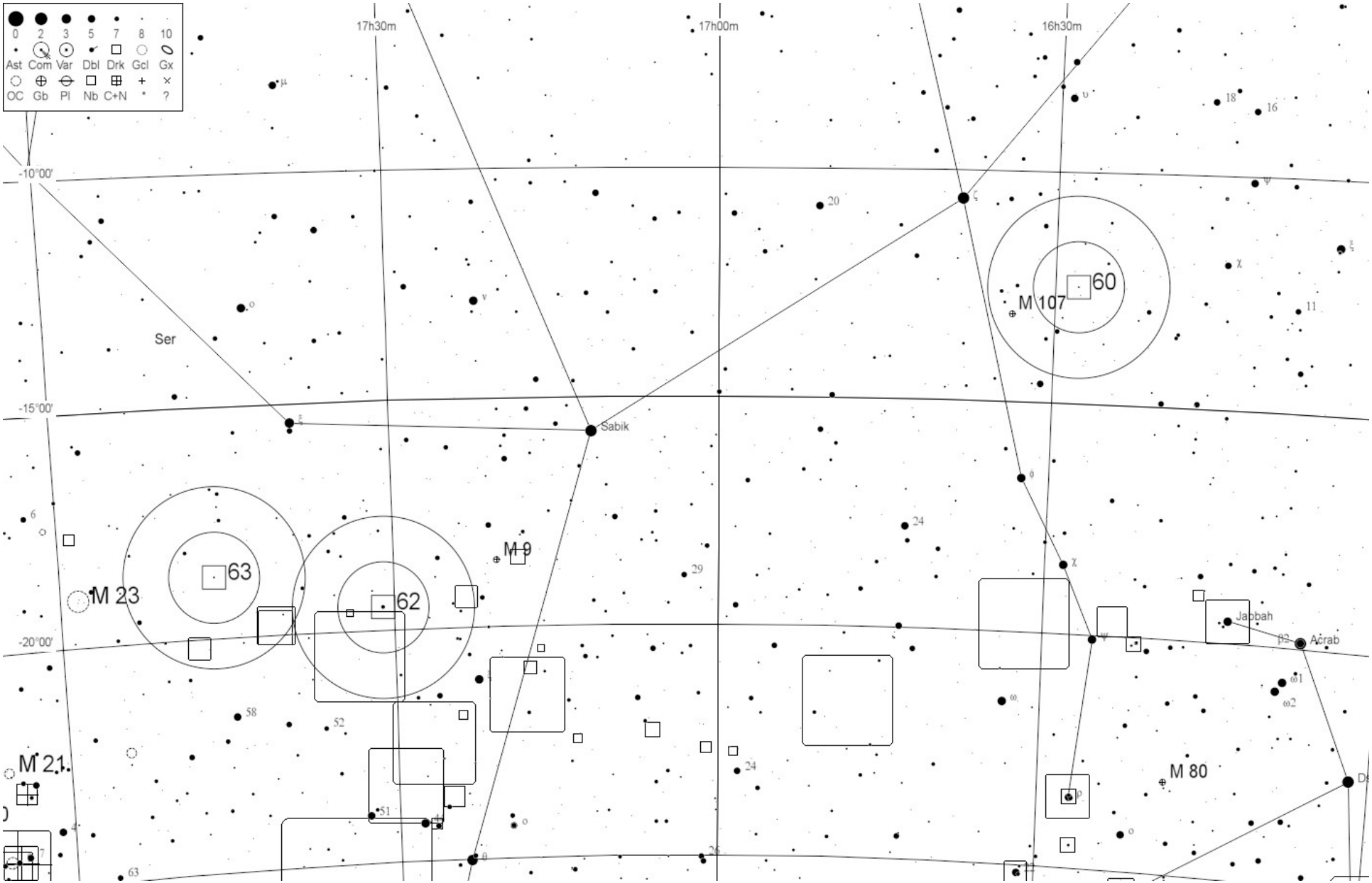

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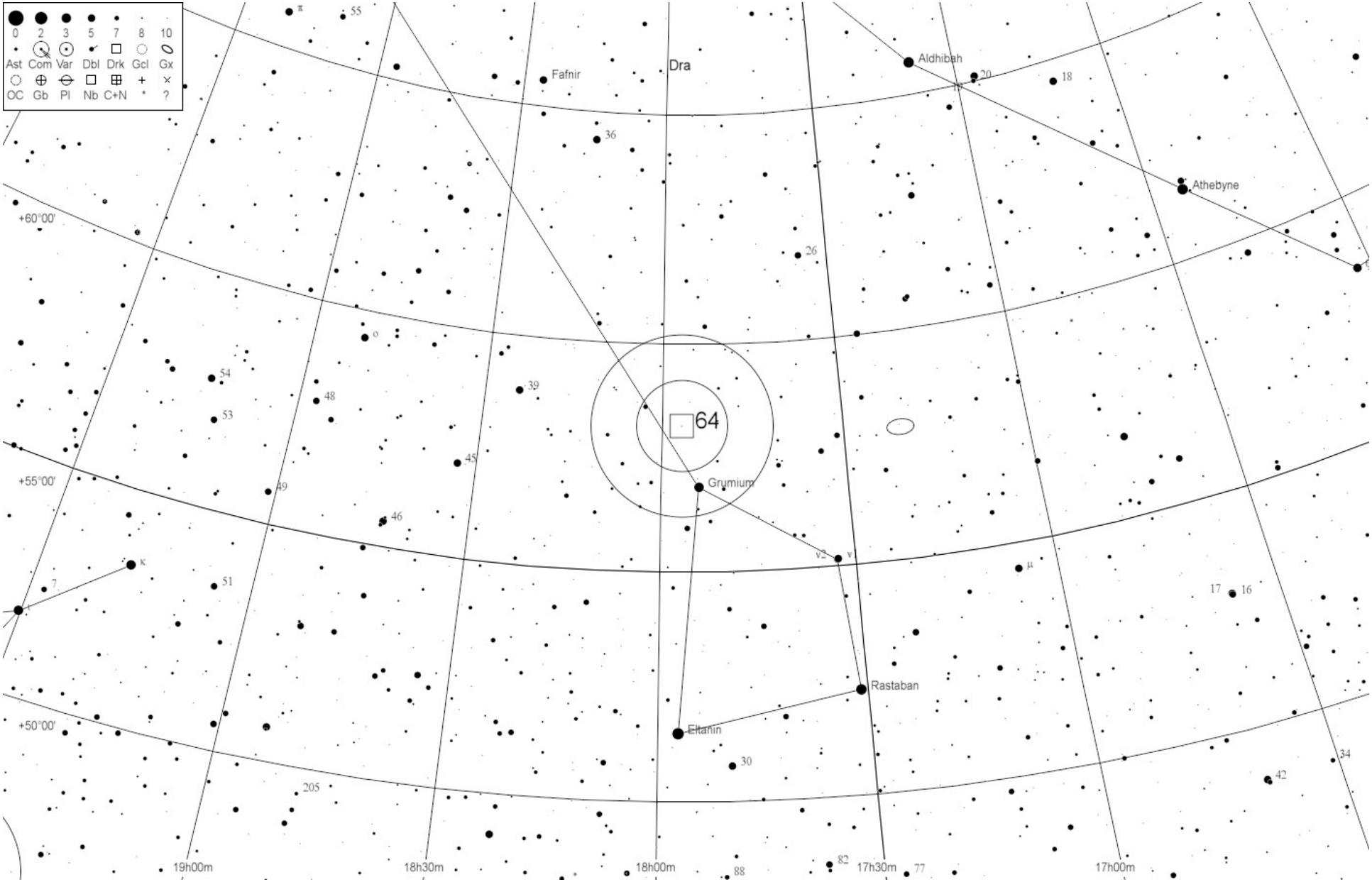

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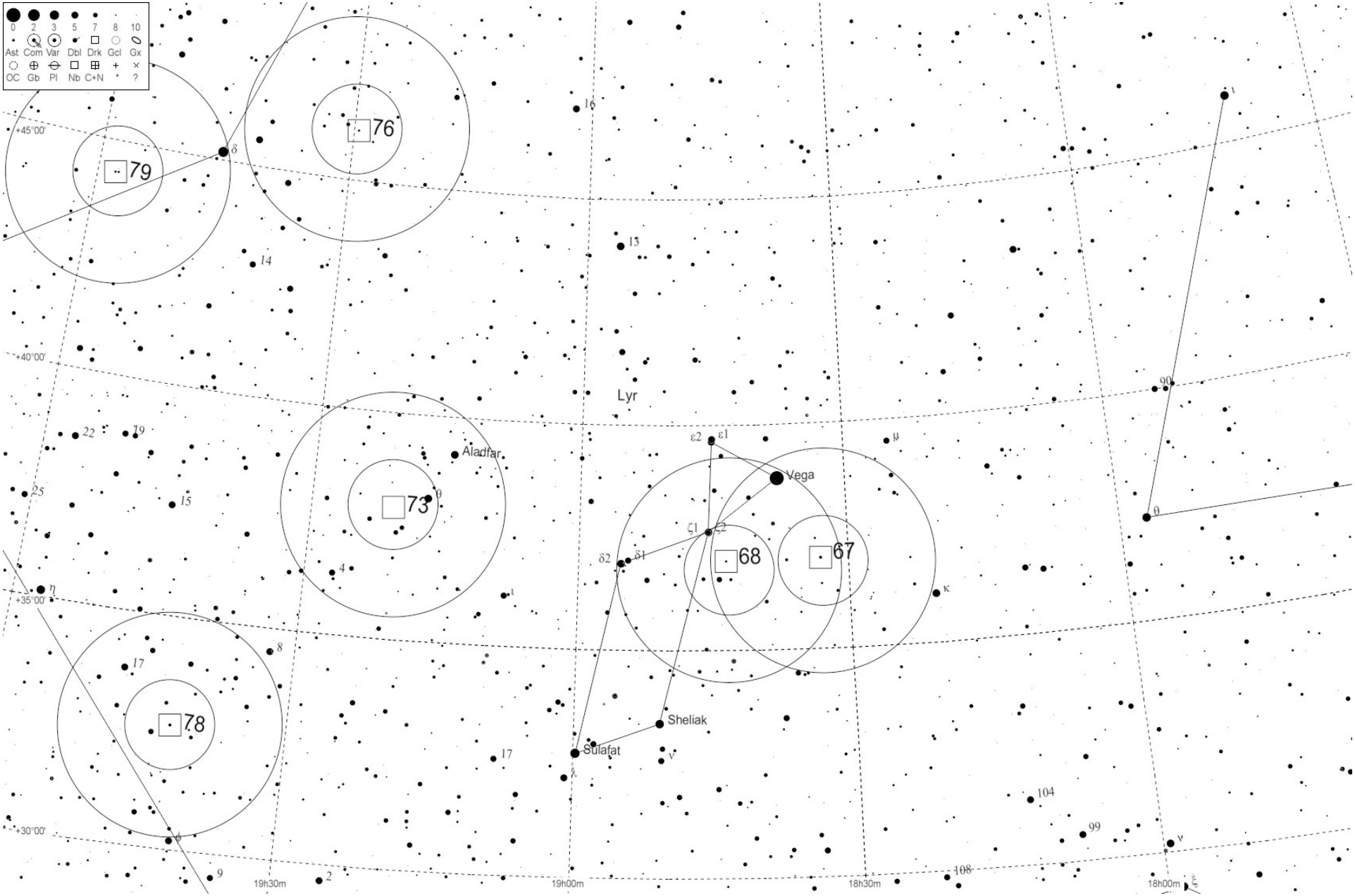

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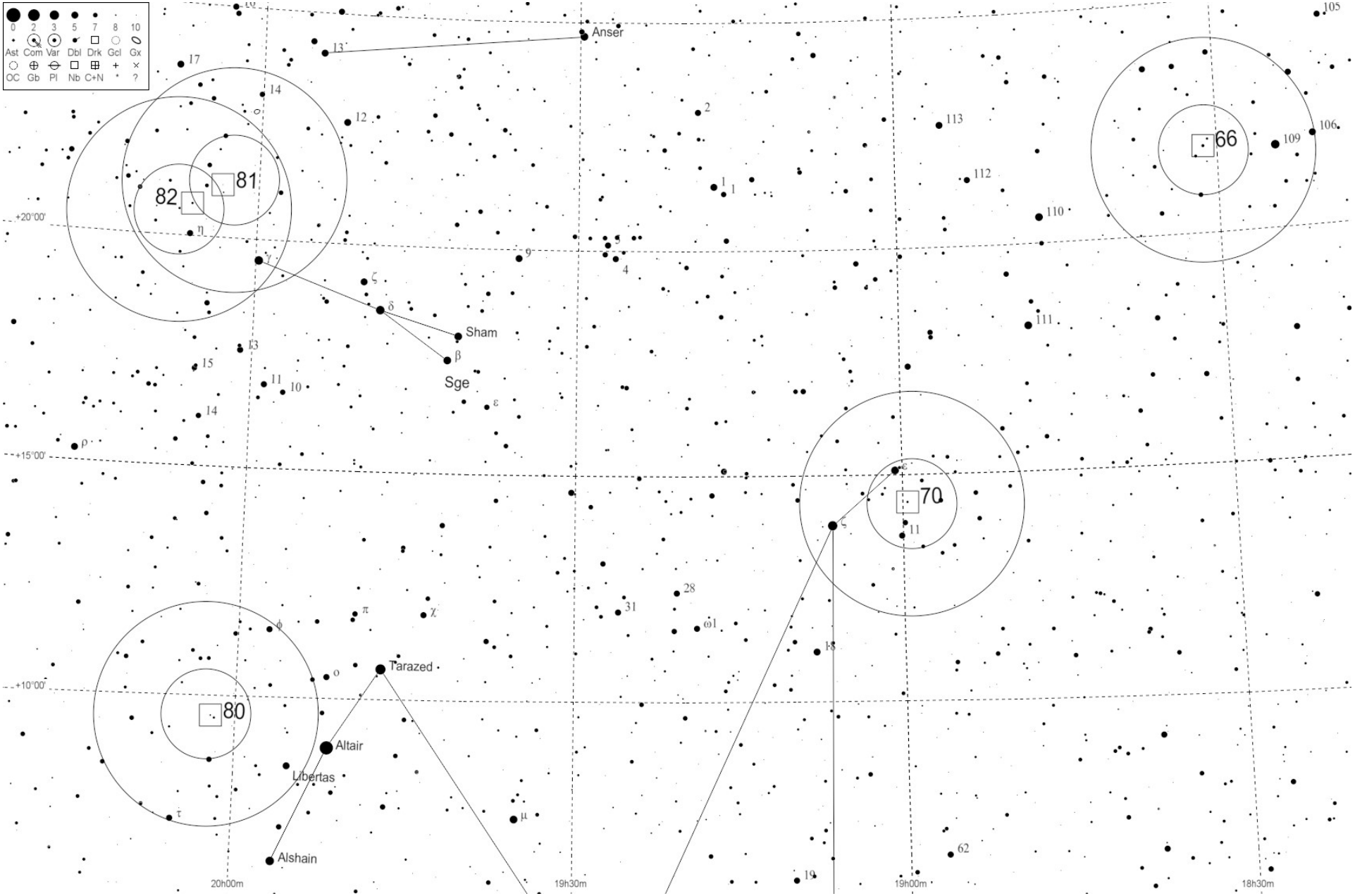

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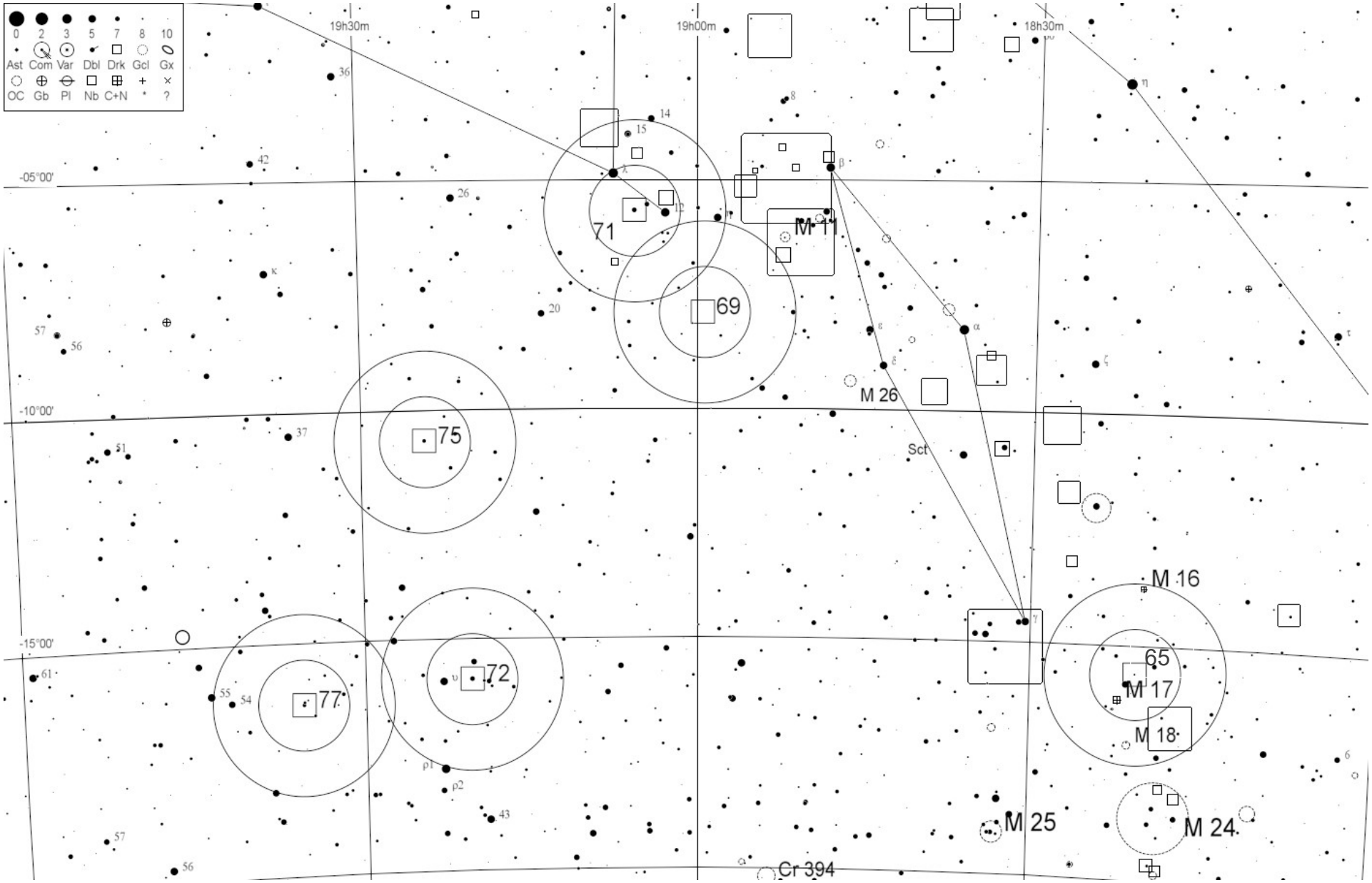


Chart 28: RA 19h - Aquila, Scutum, Sagittarius

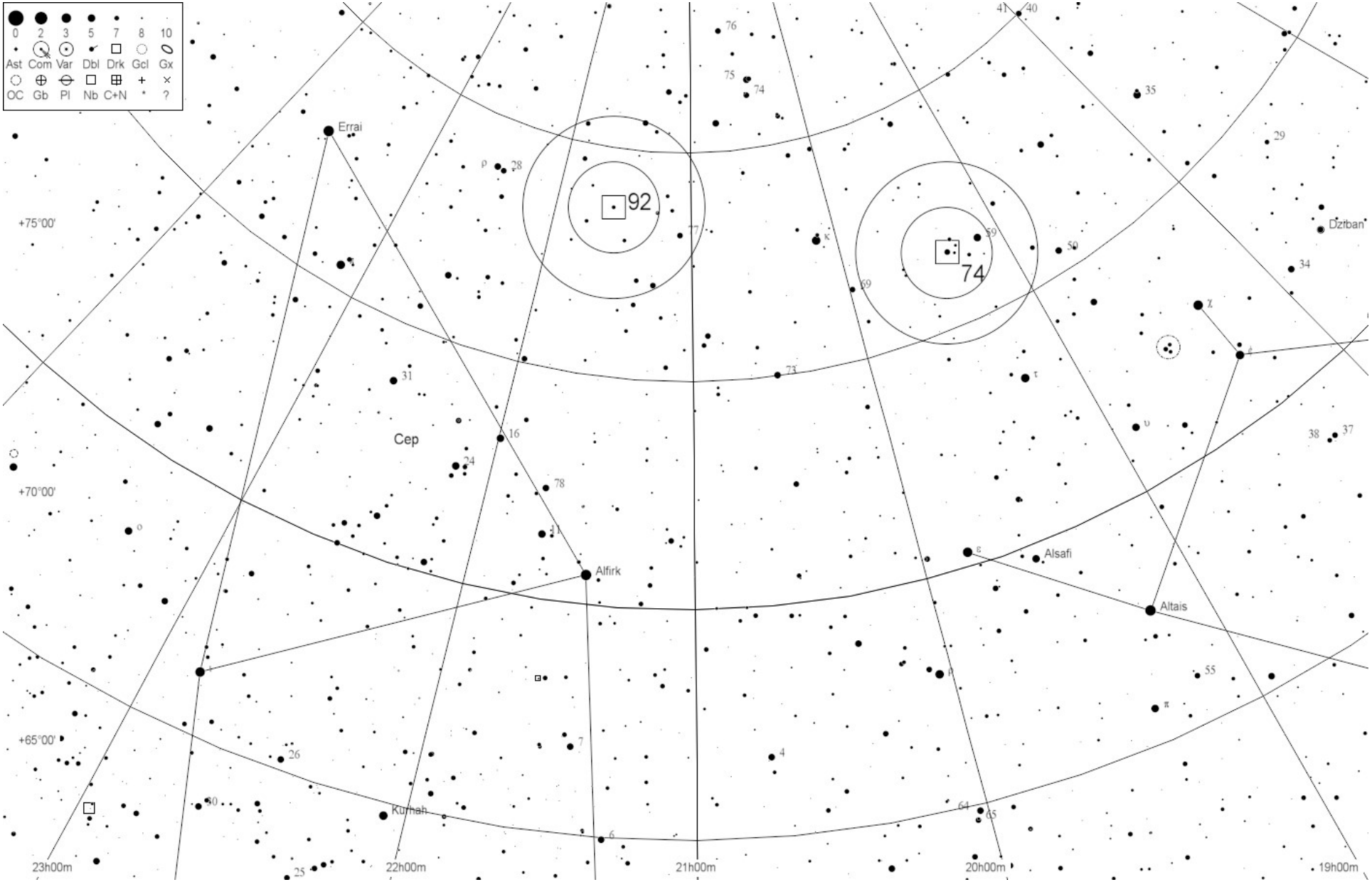


Chart 29: RA 21h - Cepheus, Draco

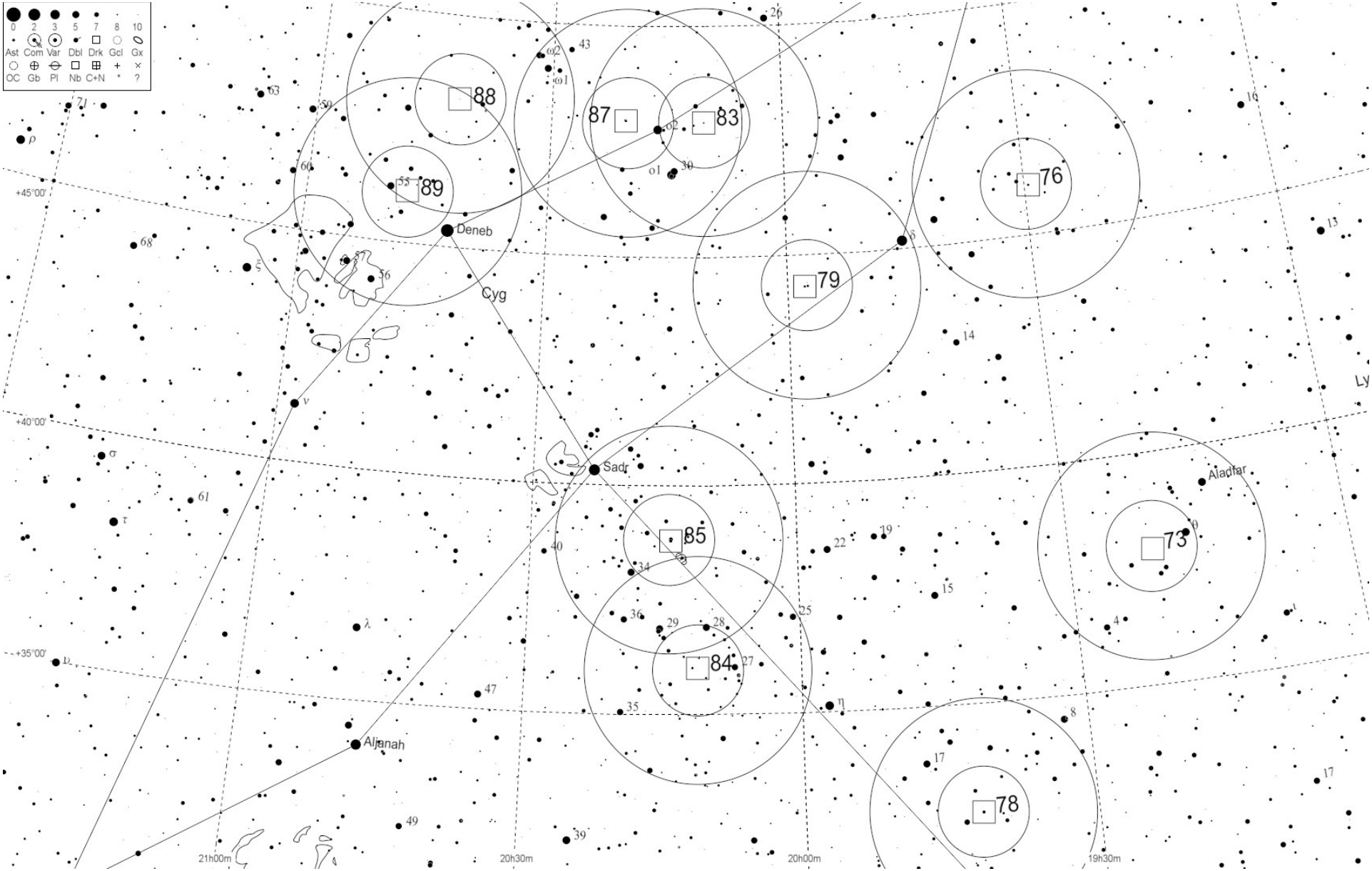


Chart 30: RA 20h - Cygnus

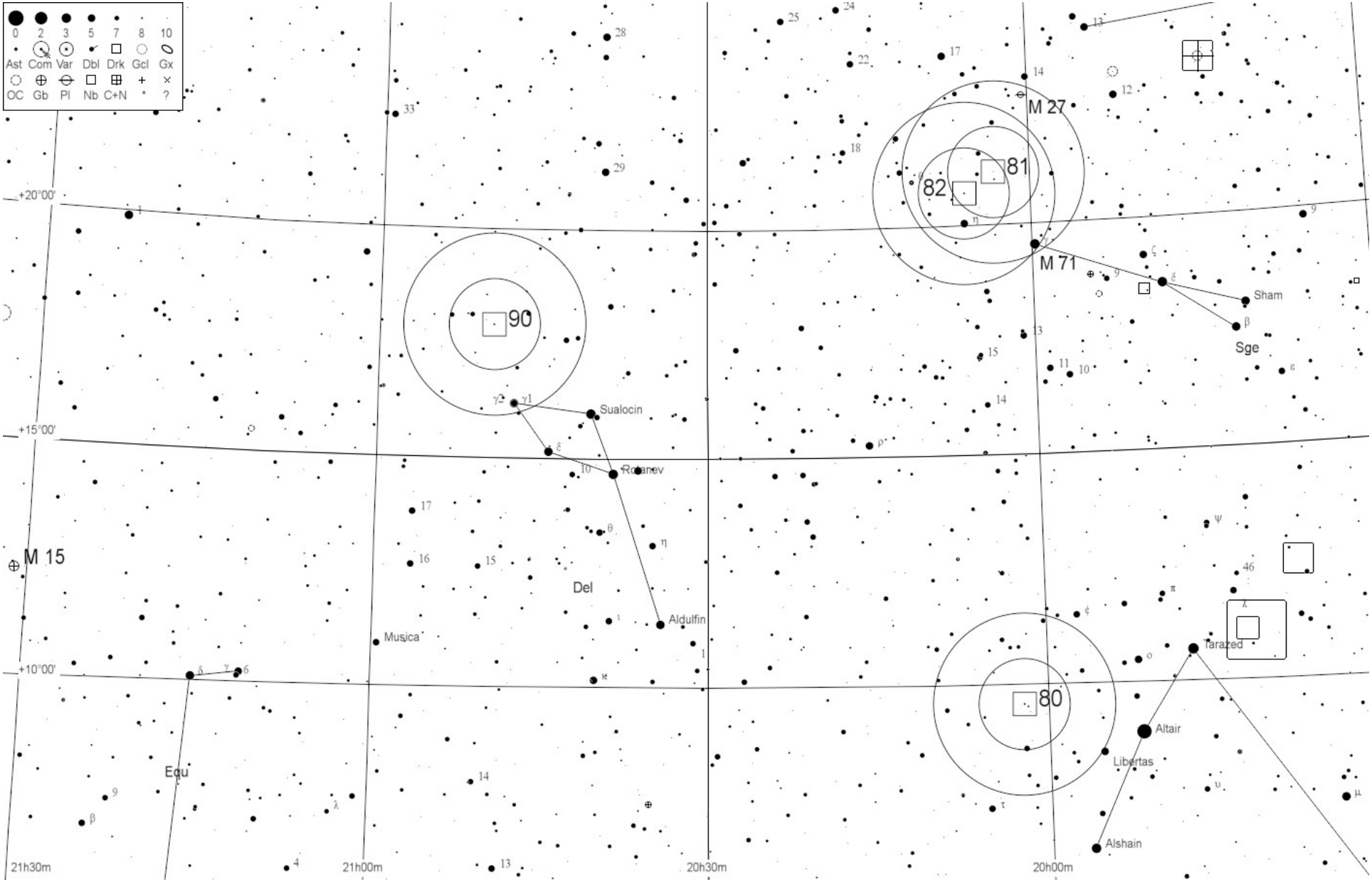


Chart 31: RA 20h30m - Aquila, Delphinus, Sagitta

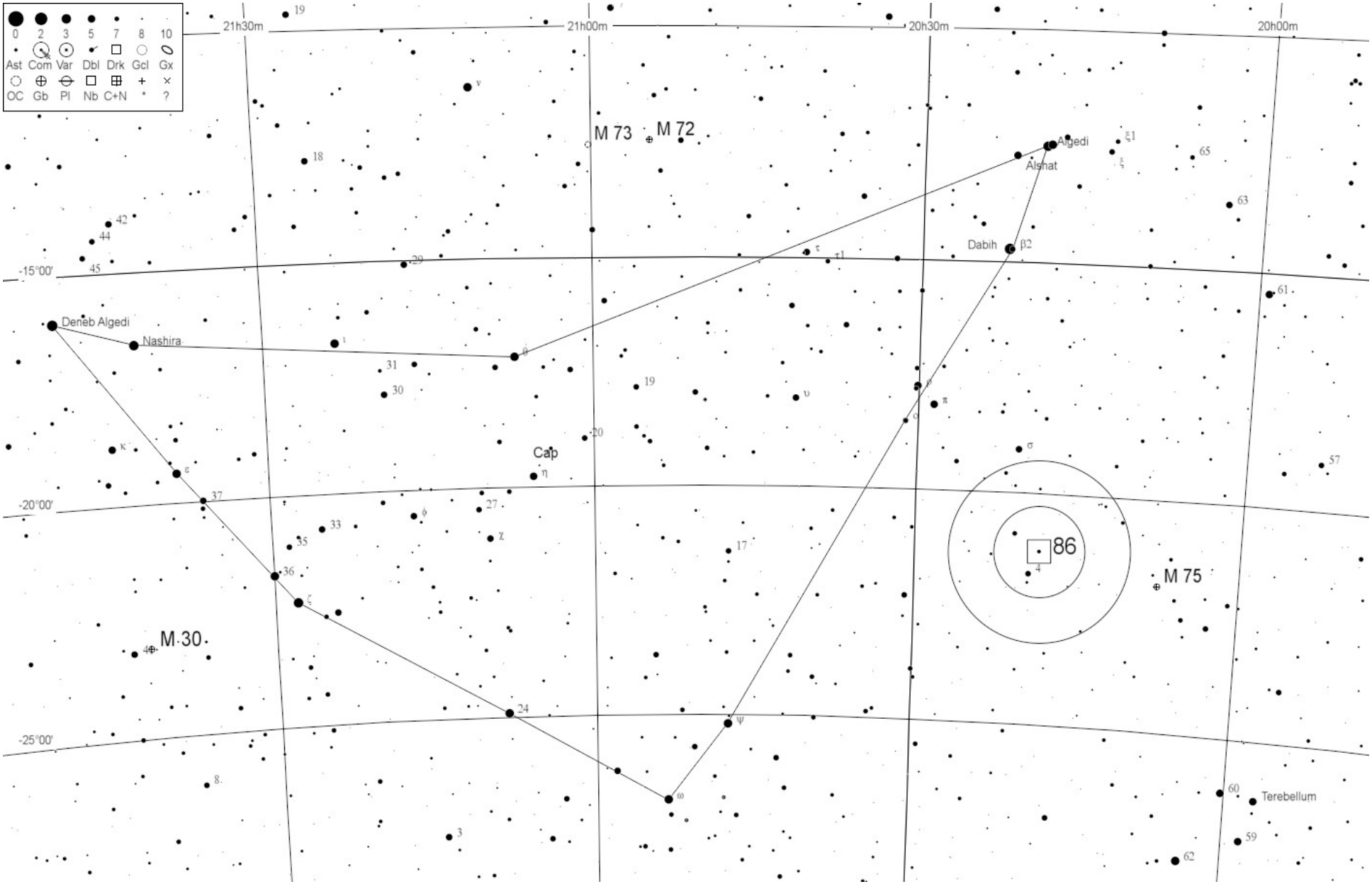


Chart 32: RA 21h - Capricorn

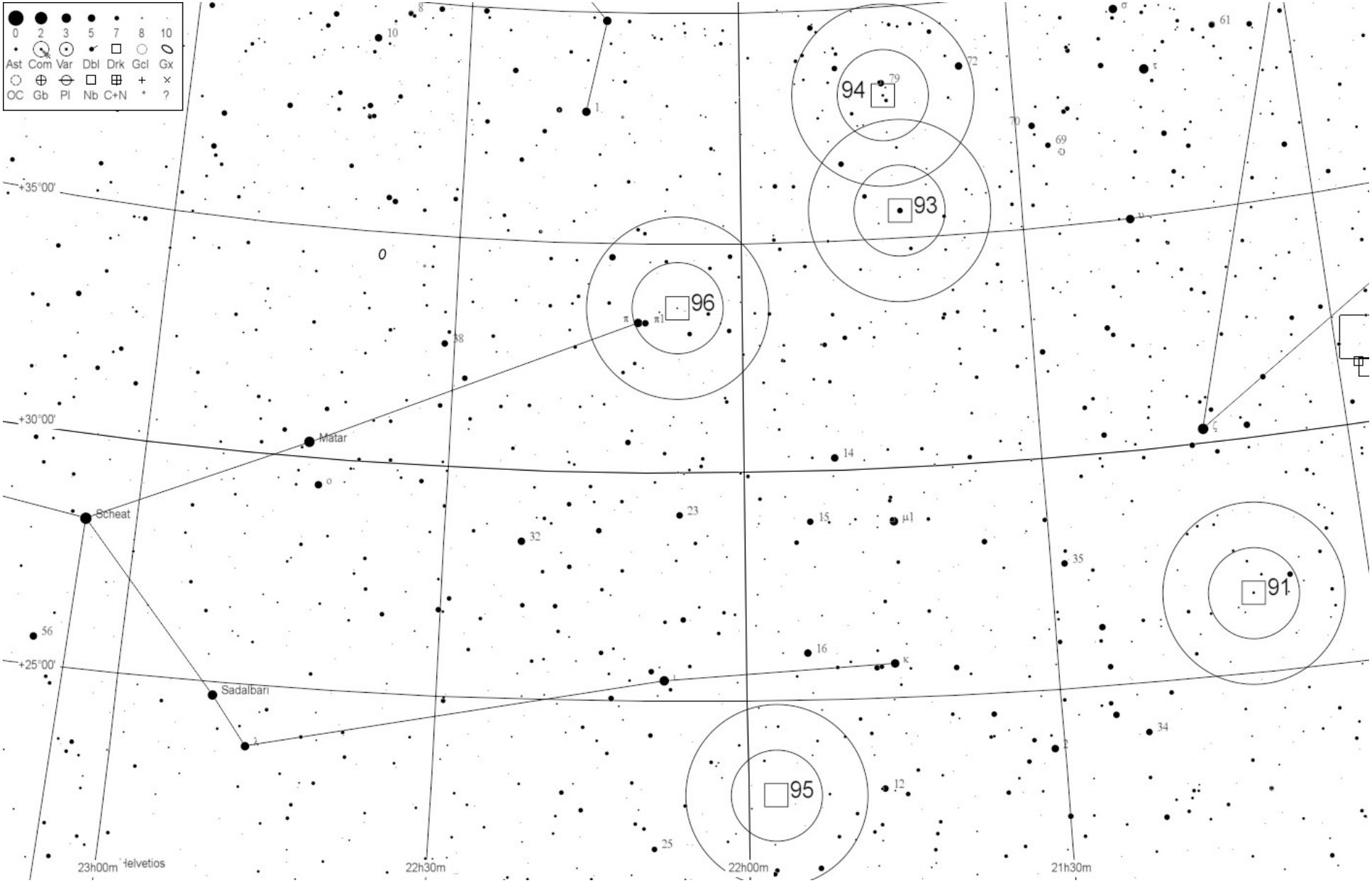


Chart 33: RA 22h -Pegasus, Cygnus, Vulpecula

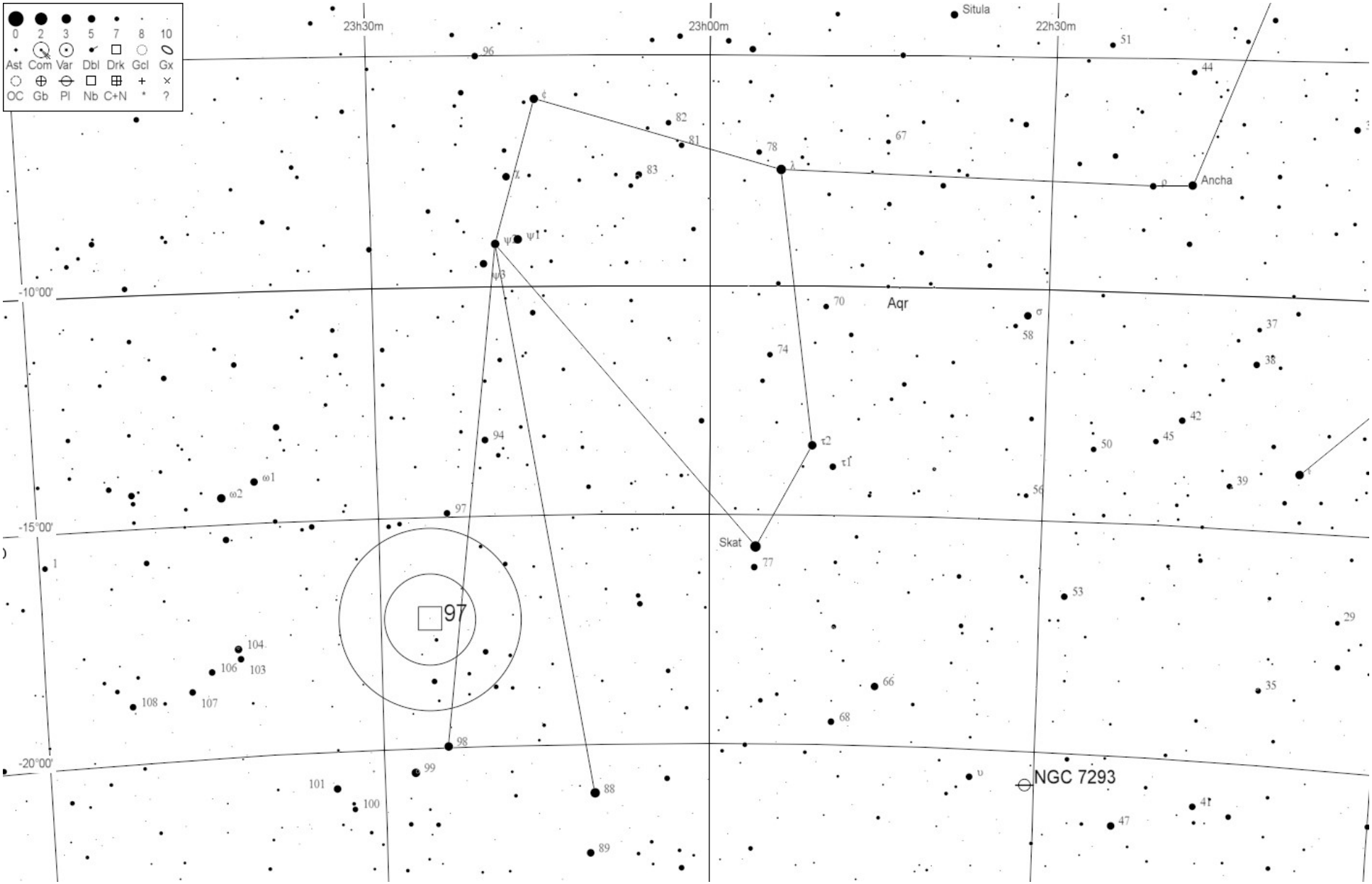


Chart 34: RA 23h - Aquarius

Carbon Star Observing Program Object List

OBJ#	Name	Catalog	RA (HMS)	DEC (DMS)	Magnitude	Period	Type	Chart
1	WZ Cas	SAO 21002	00 01 15	+60 21 19	6.9-11.0	186	C9(N1)	C01
2	SU And	GSC 2793:243	00 04 36	+43 33 04	8.0-8.5	Irr.	C6(Nb)	C02
3	SAO 109003 (Psc)	GSC 594: 778	00 05 22	+08 47 16	8.2-8.3	?	C(G4V)	C03
4	VX And	GSC 2794:14	00 19 54	+44 42 33	7.8-9.3	369	C4(N7)	C02
5	AQ And	GSC 2270:318	00 27 31	+35 35 14	6.9 – 8.6	346	C5 (Nb)	C02, C04
6	NSV 15196 (And)	SAO 74353	00 54 13	+24 04 01	8.3 – 8.7	755	C1 (Rp)	C04
7	W Cas	GSC 368:1824	00 54 53	+58 33 49	7.8 – 12.5	406	C7	C01
8	Z Psc	SAO 74593	01 16 05	+25 46 09	6.5 – 7.9	144	C7 (N0)	C04
9	V Ari	SAO 92853	02 15 00	+12 14 23	8.3 – 10.8	77	C4 (R8)	C05
10	SAO 129989 (Cet)	GSC 5285:3	02 35 06	-09 26 34	8.2 – 8.5	?	C2 (R3)	C06
11	UY And	GSC 2832:2	02 38 23	+39 10 09	7.4-12.3	?	C5(N3)	C07
12	V623 Cas	SAO 23858	03 11 25	+57 54 11	7.3-8.1	?	C4(R5)	C08
13	Y Per.	GSC 2873:1287	03 27 42	+44 10 36	8.1-11.3	249	C4(R4)	C07
14	V466 Per.	NSV 1223	03 41 29	+51 30 11	8.4-8.9	?	C5(N5)	C07
15	U Cam	SAO 12870	03 41 48	+62 38 54	6.9-7.6	?	C3-C6(N5)	C08
16	UV Cam	SAO 13009	04 05 53	+61 47 39	7.5-8.1	294	C5(R8)	C08
17	XX Cam	SAO 24431	04 08 38	+53 21 39	7.1-10.0	?	C0-C2(G1)	C07
18	ST Cam	SAO 13285	04 51 13	+68 10 07	6.7-8.4	300	C5(N5)	C08
19	TT Tau	SAO 76788	04 51 31	+28 31 36	7.7-10.0	167	C4-C7(N3)	C10
20	R Lep	SAO 150058	04 59 36	-14 48 22	5.5-11.7	427	C7(N6)	C12
21	EL Aur	SAO 24981	05 03 23	+50 37 58	8.5-8.7	Irr.	C5(N3)	C09
22	W Ori	SAO 112406	05 05 23	+01 10 39	5.8-10.0	212	C5(N5)	C11
23	TX Aur	GSC 2895: 203	05 09 05	+39 00 08	8.5-9.2	Irr.	C5(N3)	C09
24	SY Eri	SAO 131832	05 09 48	-05 30 55	8.3-10.0	96	C6(N0)	C12
25	UV Aur	SAO 57941	05 21 48	+32 30 43	7.4-10.6	394	C6-C8(Nc)	C10
26	S Aur	GSC 2411:222	05 27 07	+34 08 59	8.2-13.3	590	C4/5(N3)	C10
27	RT Ori	GSC 126: 161	05 33 13	+07 09 12	8.0-8.9	321	C6(Nb)	C11, C13
28	S Cam	SAO 13563	05 41 02	+68 47 55	7.7-11.6	327	C7(R8)	C08
29	TU Tau	SAO 77502	05 45 13	+24 25 12	5.9-9.2	190	C5(N3)	C10

Carbon Star Observing Program Object List, pg 2

OBJ#	Name	SAO	RA (HMS)	DEC (DMS)	Mag.	Per.	Type	Chart
30	Y Tau	SAO 77516	05 45 39	+20 41 42	6.5-9.2	242	C6.5(N3	C10
31	FU Aur	SAO 58449	05 48 08	+30 37 51	8.3-8.5	?	C7(N0)	C10
32	TU Gem	SAO 78066	06 10 53	+26 00 53	7.4-8.4	230	C6(N3)	C10
33	FU Mon	GSC 136: 183	06 22 23	+03 25 27	8.5 – 9.8	310	C8 (CSe)	C13
34	V Aur	GSC 3380: 1119	06 24 02	+47 42 23	8.5-13.0	333	C6 (N3)	C09
35	BL Ori	SAO 95659	06 25 28	+14 43 19	6.0-7.0	154	C6 (Nb, Tc)	C13
36	UU Aur	SAO 59280	06 36 32	+38 26 43	5.1-7.0	234	C5 – C7(N3)	C09
37	VW Gem	SAO 59383	06 42 08	+31 27 17	8.1-8.5	Irr.	C5 (Na)	C10
38	GY Mon	SAO 133825	06 53 11	-04 34 34	8.1 – 9.0	Irr.	C6 (N3/R8)	C14
39	RV Mon	SAO 114704	06 58 21	+06 10 01	7.0-8.9	132	C4-C6(Nb/R9)	C13
40	V614 Mon	SAO 134049	07 01 01	-03 15 09	7.0-7.4	60	C4(R5)	C14
41	RY Mon	GSC 5381: 403	07 06 56	-07 33 26	7.5-9.2	456	C5-C7(N5/R)	C14
42	W CMa	SAO 152427	07 08 03	-11 55 23	6.4-7.9	Irr.	C6(N)	C14
43	R CMi	SAO 96548	07 08 42	+10 01 26	7.3-11.6	338	C7(Csep)	C13
44	BM Gem	GSC 1913: 1170	07 20 59	+24 59 58	8.3-9.2	286	C5(Nb)	C16
45	RU Cam	SAO 14157	07 21 44	+69 40 14	8.1-9.8	22	C0-C3(K0-R0)	C08, C17
46	NQ Gem	SAO 79474	07 31 54	+24 30 12	7.4-8.0	70	C6(R9)	C16
47	RU Pup	SAO 175215	08 07 29	-22 54 45	8.1-11.1	425	C5(N3)	C15
48	X Cnc	SAO 98230	08 55 22	+17 13 52	5.6-7.5	195	C5(N3)	C16
49	T Cnc	SAO 80524	08 56 40	+19 30 56	7.6-10.5	482	C3-C5(R6-N6)	C16
50	Y Hya	SAO 178088	09 51 03	-23 01 02	6.5-9.0	303	C5(N3)	C18
51	U Hya	SAO 156110	10 37 33	-13 23 04	4.5-6.2	450	C6.5(N2)	C18
52	VY UMa	SAO 15274	10 45 04	+67 24 40	5.9-7.0	Irr.	C6(N0)	C17, C19
53	V Hya	SAO 179278	10 51 37	-21 15 00	6.5-12.0	531	C6-C7(N6e)	C18
54	SS Vir	GSC 282:753	12 25 14	+00 46 10	6.0-9.6	364	C6(Ne)	C21
55	Y CVn	SAO 44317	12 45 07	+45 26 24	4.8-6.4	157	C5(N3)	C20
56	RY Dra	SAO 15945	12 56 25	+65 59 39	6.0-8.0	200	C4(N4p)	C19
57	SAO 157721 (Vir)	GSC 6118:1194	13 06 24	-20 03 31	8.5-8.5	?	C2(K5p)	C22
58	V CrB	SAO 64929	15 49 31	+39 34 17	6.9-12.6	358	C6(N2e)	C23

Carbon Star Observing Program Object List, pg 3

OBJ#	Name	SAO	RA (HMS)	DEC (DMS)	Mag.	Per.	Type	Chart
59	RR Her	SAO 29781	16 04 13	+50 29 56	7.8-12.5	240	C5-C8(N0e)	C23
60	V Oph	SAO 159916	16 26 43	-12 25 35	7.3-11.6	297	C5-C7(N3e)	C24
61	SAO 46574 (Her)	GSC 3081: 810	17 13 31	+42 06 22	7.3-7.7	?	C3(RU)	C23
62	TW Oph	GSC 6243: 462	17 29 43	-19 28 22	7.0-9.0	185	C5(Nb)	C24
63	SZ Sgr	SAO 160795	17 44 56	-18 39 26	8.2-9.2	73	C7(Nb)	C24
64	T Dra	GSC 3914: 546	17 56 23	+58 13 06	7.2-13.5	422	C6-C8(N0e)	C25
65	FO Ser	SAO 161327	18 19 21	-15 36 46	8.5-8.7	Irr.	C4(R6)	C28
66	AC Her	SAO 86134	18 30 16	+21 52 00	6.9-9.0	75	C0(F2pIb-K4e)	C27
67	T Lyr	SAO 67087	18 32 20	+36 59 55	7.5-9.3	Irr.	C6(R6)	C26
68	HK Lyr	GSC 2649: 507	18 42 50	+36 57 30	7.8-9.6	Irr.	C6(N4)	C26
69	S Sct	SAO 142674	18 50 20	-07 54 27	6.3-9.0	148	C6(N3)	C28
70	UV Aql	GSC 1051:51	18 58 32	+14 21 49	8.0 – 9.6	386	C5(N4)	C27
71	V Aql	SAO 142985	19 04 24	-05 41 05	6.6-8.4	353	C5-C6(N6)	C28
72	V1942 Sgr	SAO 162465	19 19 09	-15 54 30	6.7-7.0	Irr.	C6(N2/R8)	C28
73	U Lyr	GSC 3134:1708	19 20 09	+37 52 36	8.3 – 13.5	452	C4 (N0e)	C26, C30
74	UX Dra	SAO 9404	19 21 35	+76 33 34	5.9-7.1	168	C7(N0)	C29
75	NSV 11960 (Aql)	SAO 162551	19 23 10	-10 42 11	7.0 – 7.1	?	C2 (R0)	C28
76	AW Cyg	GSC 3543: 2275	19 28 47	+46 02 38	7.1 – 8.5	340	C4 (N3)	C26, C30
77	AQ Sgr	SAO 162777	19 34 18	-16 22 27	6.6 – 8.5	200	C7 (N3)	C28
78	TT Cyg	SAO 68688	19 40 57	+32 37 05	7.0 – 9.1	118	C5 (N3e)	C26, C30
79	AX Cyg	GSC 3149: 942	19 57 12	+44 15 40	7.9 – 8.8	Irr.	C4 (N6)	C26, C30
80	V1469 Aql	SAO 125356	20 01 03	+09 30 51	8.4 – 8.7	98	C4 (N0v)	C27, 31
81	BF Sge	GSC 1629: 945	20 02 23	+21 05 24	8.5 – 10.0	177	C4 (N3)	C27, 31
82	X Sge	HD 190606	20 05 05	+20 38 51	7.0 – 9.7	196	C6 (N3)	C27, 31
83	SV Cyg	GSC 3563: 462	20 09 30	+47 52 17	8.5 – 8.7	?	C5 – C7 (N3)	C30
84	RY Cyg	GSC 2683: 3082	20 10 23	+35 56 50	8.5 – 10.3	Irr.	C4 – C6 (N)	C30
85	RS Cyg	SAO 69636	20 13 23	+38 43 44	6.5 – 9.5	417	C8 (N0pe)	C30
86	RT Cap	GSC 6340: 1015	20 17 06	-21 19 04	7.0 – 8.1	393	C6 (N3)	C32
87	U Cyg	SAO 49477	20 19 36	+47 53 39	5.9 – 12.1	463	C7 – C9 (Npe)	C30

Carbon Star Observing Program Object List, pg 4

OBJ#	Name	SAO	RA (HMS)	DEC (DMS)	Mag.	Per.	Type	Chart
88	V Cyg	SAO 49940	20 41 18	+48 08 28	7.7 – 13.9	421	C5 – C7 (Npe)	C30
89	CY Cyg	SAO 50053	20 46 50	+46 03 06	7.9 – 8.4	?	CS (M2p)	C30
90	SAO 106516 (Del)	GSC 1651: 1359	20 48 36	+17 50 23	7.9 – 8.1	?	C1 (R0)	C31
91	NSV 13571 (Vul)	SAO 89499	21 09 59	+26 36 54	8.1 – 8.2	?	C1 (Kp)	C33
92	S Cep	SAO 10100	21 35 12	+78 37 28	7.4 – 12.9	487	C7 (N8e)	C29
93	V460 Cyg	SAO 71613	21 42 01	+35 30 36	5.6 – 7.0	180	C6 (N1)	C33
94	RV Cyg	SAO 71642	21 43 16	+38 01 02	7.1 – 9.3	263	C6 (N5)	C33
95	RX Peg	HD208526	21 56 22	+22 51 39	7.7 – 9.5	629	C4 (N3)	C33
96	RZ Peg	GSC 2724: 1872	22 05 52	+33 30 24	7.6 – 13.6	439	C9 (Ne)	C33
97	RU Aqu	SAO 165676	23 24 24	-17 19 08	8.5 – 10.1	69	C6 (M5e)	C34
98	ST And	GSC 2778: 765	23 38 45	+35 46 21	7.7 – 11.8	328	C4 – C6 (R3e)	C02
99	TX Psc	SAO 128374	23 46 23	+03 29 12	4.8 – 5.2	Irr.	C7 (N0)	C03
100	SAO 128396 (Psc)	GSC 592: 649	23 49 05	+06 22 56	8.5 – 8.8	?	C3 (R3)	C03

Carbon Stars Sorted by Brightest Magnitude

OBJ#	Name	Mag+	Mag-	Avg.	Chart
51	U Hya	4.5	6.2	5.4	C18
99	TX Psc	4.8	5.2	5.0	C03
55	Y CVn	4.8	6.4	5.6	C20
36	UU Aur	5.1	7	6.1	C09,C12
20	R Lep	5.5	11.7	8.6	C12
93	V460 Cyg	5.6	7	6.3	C29
48	X Cnc	5.6	7.5	6.6	C16
22	W Ori	5.8	10	7.9	C11
52	VY UMa	5.9	7	6.5	C17,C19
74	UX Dra	5.9	7.1	6.5	C29
29	TU Tau	5.9	9.2	7.6	C10
87	U Cyg	5.9	12.1	9.0	C30
35	BL Ori	6	7	6.5	C13
56	RY Dra	6	8	7.0	C19
54	SS Vir	6	9.6	7.8	C21
69	S Sct	6.3	9	7.7	C28
42	W CMa	6.4	7.9	7.2	C14
8	Z Psc	6.5	7.9	7.2	C04
50	Y Hya	6.5	9	7.8	C18
30	Y Tau	6.5	9.2	7.9	C10
85	RS Cyg	6.5	9.5	8.0	C30
53	V Hya	6.5	12	9.3	C18
71	V Aql	6.6	8.4	7.5	C28
77	AQ Sgr	6.6	8.5	7.6	C28
72	V1942 Sgr	6.7	7	6.9	C28
18	ST Cam	6.7	8.4	7.6	C08
15	U Cam	6.9	7.6	7.3	C08
5	AQ And	6.9	8.6	7.8	C02,C04
66	AC Her	6.9	9	8.0	C27
1	WZ Cas	6.9	11	9.0	C01
58	V CrB	6.9	12.6	9.8	C23
75	NSV 11960	7	7.1	7.1	C28
40	V614 Mon	7	7.4	7.2	C14
86	RT Cap	7	8.1	7.6	C32
39	RV Mon	7	8.9	8.0	C13
62	TW Oph	7	9	8.0	C24
78	TT Cyg	7	9.1	8.1	C26,C30
82	X Sge	7	9.7	8.4	C27,31
76	AW Cyg	7.1	8.5	7.8	C26,C30
94	RV Cyg	7.1	9.3	8.2	C33
17	XX Cam	7.1	10	8.6	C07
64	T Dra	7.2	13.5	10.4	C25
61	SAO 46574	7.3	7.7	7.5	C23
12	V623 Cas	7.3	8.1	7.7	C08
43	R CMi	7.3	11.6	9.5	C13
60	V Oph	7.3	11.6	9.5	C24
46	NQ Gem	7.4	8	7.7	C16
32	TU Gem	7.4	8.4	7.9	C10
25	UV Aur	7.4	10.6	9.0	C10
11	UY And	7.4	12.3	9.9	C07
92	S Cep	7.4	12.9	10.2	C32
16	UV Cam	7.5	8.1	7.8	C08
41	RY Mon	7.5	9.2	8.4	C14
67	T Lyr	7.5	9.3	8.4	C26
49	T Cnc	7.6	10.5	9.1	C16
96	RZ Peg	7.6	13.6	10.6	C33
95	RX Peg	7.7	9.5	8.6	C33
19	TT Tau	7.7	10	8.9	C10
28	S Cam	7.7	11.6	9.7	C08
98	ST And	7.7	11.8	9.8	C02
88	V Cyg	7.7	13.9	10.8	C30
4	VX And	7.8	9.3	8.6	C02
68	HK Lyr	7.8	9.6	8.7	C26
7	W Cas	7.8	12.5	10.2	C01
59	RR Her	7.8	12.5	10.2	C23
90	SAO 106516	7.9	8.1	8.0	C31
89	CY Cyg	7.9	8.4	8.2	C30
79	AX Cyg	7.9	8.8	8.4	C26,C30
2	SU And	8	8.5	8.3	C02
27	RT Ori	8	8.9	8.5	C11,C13
70	UV Aql	8	9.6	8.8	C27
91	NSV 13571	8.1	8.2	8.2	C33
37	VW Gem	8.1	8.5	8.3	C10
38	GY Mon	8.1	9	8.6	C14
45	RU Cam	8.1	9.8	9.0	C08,C17
47	RU Pup	8.1	11.1	9.6	C15
13	Y Per	8.1	11.3	9.7	C07
3	SAO 109003	8.2	8.3	8.3	C03
10	SAO 129989	8.2	8.5	8.4	C06
63	SZ Sgr	8.2	9.2	8.7	C24
26	S Aur	8.2	13.3	10.8	C10
31	FU Aur	8.3	8.5	8.4	C10
6	NSV 15196	8.3	8.7	8.5	C04
44	BM Gem	8.3	9.2	8.8	C16
24	SY Eri	8.3	10	9.2	C12
9	V Ari	8.3	10.8	9.6	C05
73	U Lyr	8.3	13.5	10.9	C26,C30
80	V1469 Aql	8.4	8.7	8.6	C27,31
14	V466 Per	8.4	8.9	8.7	C07
57	SAO 157721	8.5	8.5	8.5	C22
21	EL Aur	8.5	8.7	8.6	C09
65	FO Ser	8.5	8.7	8.6	C28
83	SV Cyg	8.5	8.7	8.6	C30
100	SAO 128396	8.5	8.8	8.7	C03
23	TX Aur	8.5	9.2	8.9	C09
33	FU Mon	8.5	9.8	9.2	C13
81	BF Sge	8.5	10	9.3	C27,31
97	RU Aqu	8.5	10.1	9.3	C34
84	RY Cyg	8.5	10.3	9.4	C30
34	V Aur	8.5	13	10.8	C09,C12

Carbon Star Observing Program Observing Log

Observer's Name:_____ Date:_____ Time:_____

Seeing/Transparency:_____ Lat:_____ Lon:_____

Catalog ID:_____ Star Name:_____ Alt name:_____

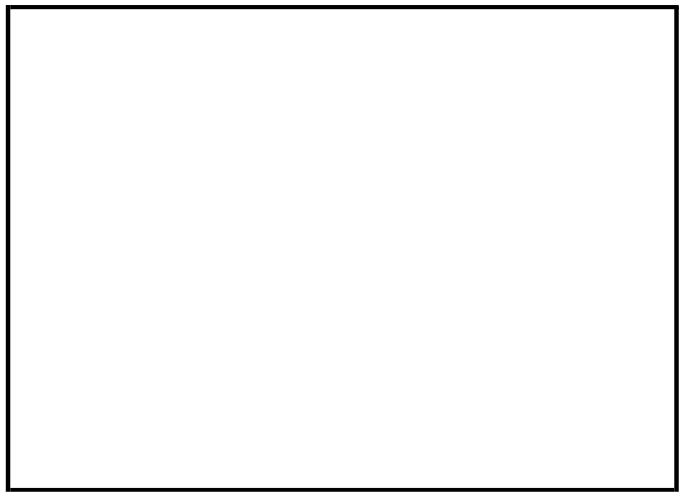
Constellation:_____ RA:_____ Dec:_____

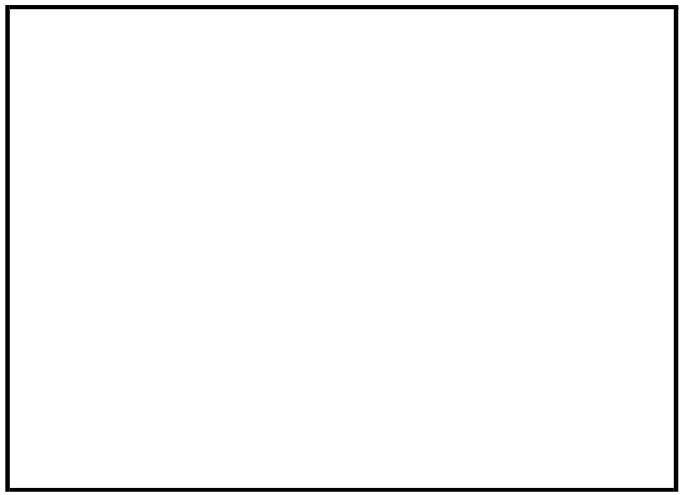
Telescope:_____ Magnification:_____

Description:_____

_____

_____





Carbon Star Observing Program Observing Log

Observer's Name:_____ Date:_____ Time:_____

Seeing/Transparency:_____ Lat:_____ Lon:_____

Catalog ID:_____ Star Name:_____ Alt name:_____

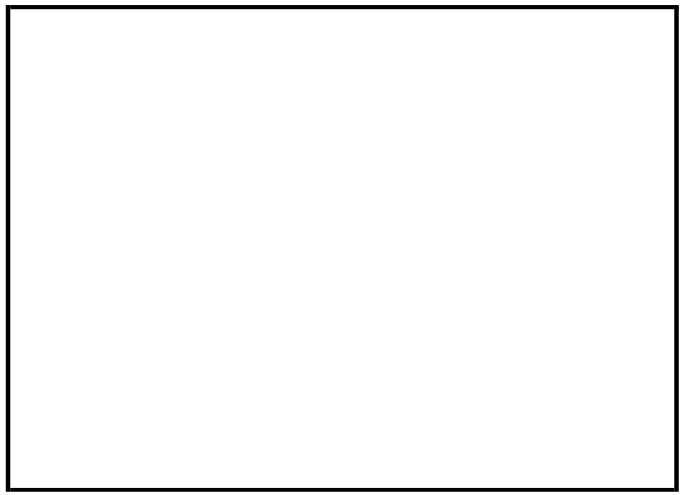
Constellation:_____ RA:_____ Dec:_____

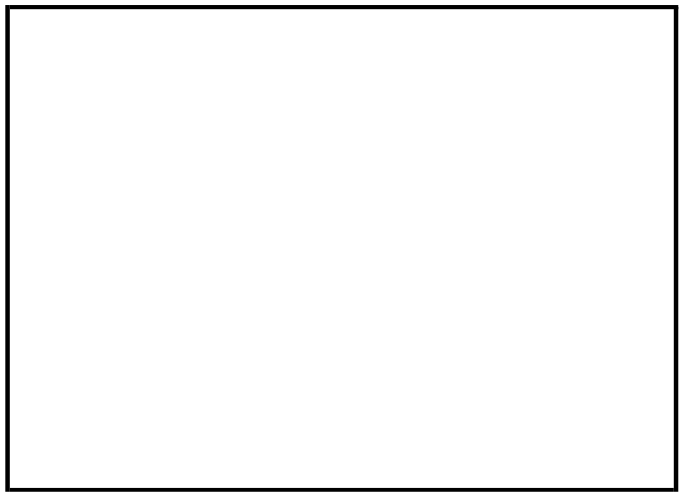
Telescope:_____ Magnification:_____

Description:_____

_____

_____





Appendix A - Seeing and Transparency

From www.astroleague.org/content/seeing-and-transparency-guide

Here are two scales that are acceptable for all Observing Programs. They are simple to use and require no special equipment. Both of these values can be done very formally using special equipment, but for the AL Observing Programs this level of effort is not required.

Seeing: How stable is the sky?

- E (excellent) - The brighter stars are not twinkling at all.
- VG (very good) - The stars are twinkling slightly, but the brighter planets are not twinkling.
- G (good) - The brighter planets are twinkling slightly.
- F (fair) - The brighter planets are obviously twinkling.
- P (poor) - The atmosphere is turbulent. all objects are twinkling to the points where observation is not practical.

Transparency: How clear is the sky?

Transparency is a measure of what you can see in the nighttime sky in spite of dust, smoke, haze, humidity, or light pollution. An easy way to measure this is to use the magnitude of the faintest star you can see. Ideally, this would be looking straight up at zenith. But, to make life simpler, you can use the Little Dipper (Ursa Minor) if you can see it. Here is the scale.

- 1 - If you can't see Polaris.
- 2 - If you can only see Polaris.
- 3 - If you can see the two stars on the end of the bowl of the Little Dipper (Kochab and Pherkad).
- 4 - If you can see any of the stars in the handle of the Little Dipper.
- 5 - If you can see 6 of the 7 stars in the Little Dipper.
- 6 - If you can see all 7 stars in the Little Dipper.
- 7 - If you can see stars near the Little Dipper that are not part of the stick figure. (I envy your young eyes...)

Although atmospheric extinction will vary from season to season, and from latitude to latitude, using the Little Dipper is a simple and reasonable solution.

Limiting Magnitude/Transparency Charts

To help judge the transparency where you're observing, here are charts for Polaris, Pegasus, Gemini, Leo, and Bootes. For the purpose of this guide, limiting magnitude is the dimmest star visible to the naked eye, though it can also apply to telescopes and binoculars as well. If the limiting magnitude is magnitude 5, then anything brighter (magnitude number smaller) will be visible, so you can see all 7 stars in the Little Dipper.

Transparency	Ursa Minor	Limiting Magnitude
1	Can't See Polaris	Magnitude 1.5
2	Can only see Polaris	Magnitude 2
3	Can see 3 stars of Little Dipper	Magnitude 3
4	Can see 1 star in the Little Dipper's handle	Magnitude 4
5	Can see 6 of 7 stars in the Little Dipper	Magnitude 4.5
6	Can see all 7 stars in the Little Dipper	Magnitude 5
7	Can see all 7 stars plus more in UMI	Magnitude 5.5+

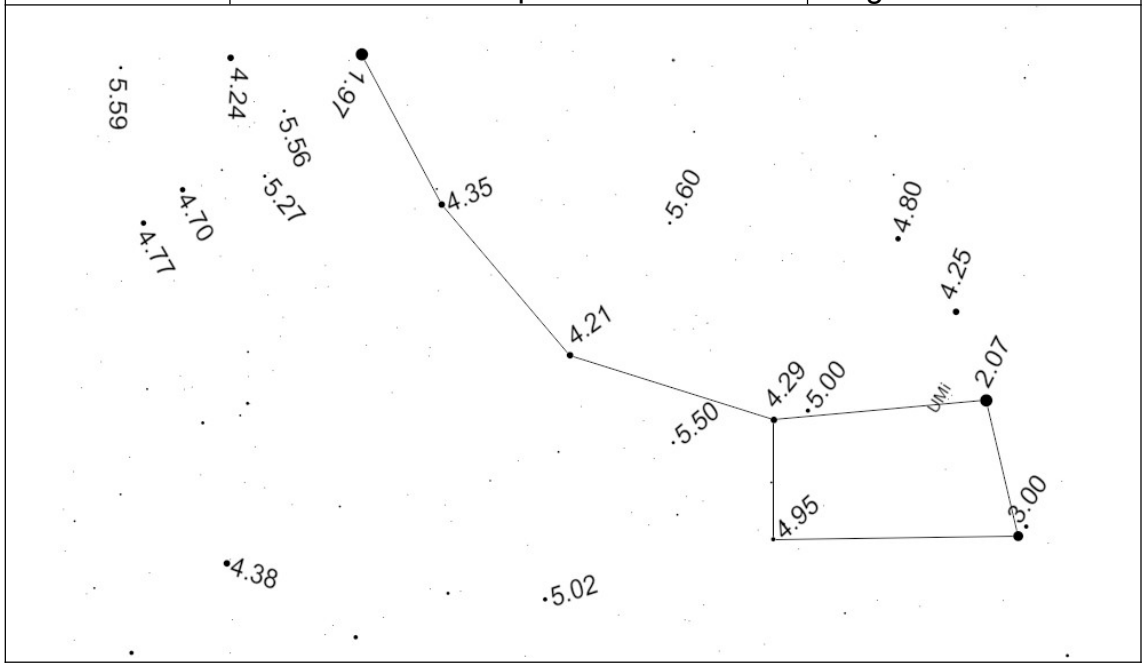


Chart A1 Polar Limiting Magnitude

Transparency	Limiting Magnitude
1	Magnitude 1.5
2	Magnitude 2
3	Magnitude 3
4	Magnitude 4
5	Magnitude 4.5
6	Magnitude 5
7	Magnitude 5.5+

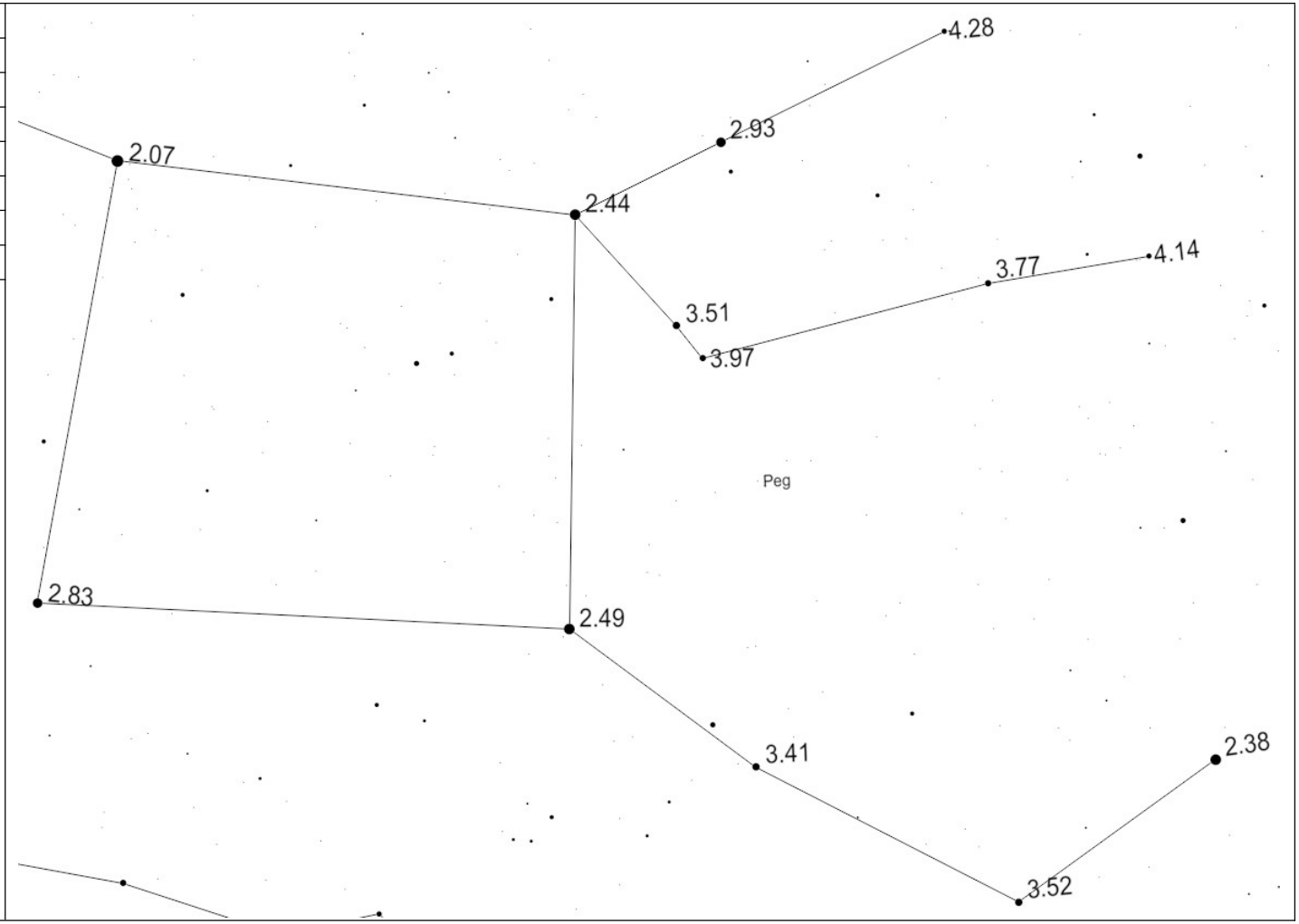


Chart A2 RA 0h Pegasus Limiting Magnitude

Transparency	Limiting Magnitude
1	Magnitude 1.5
2	Magnitude 2
3	Magnitude 3
4	Magnitude 4
5	Magnitude 4.5
6	Magnitude 5
7	Magnitude 5.5+

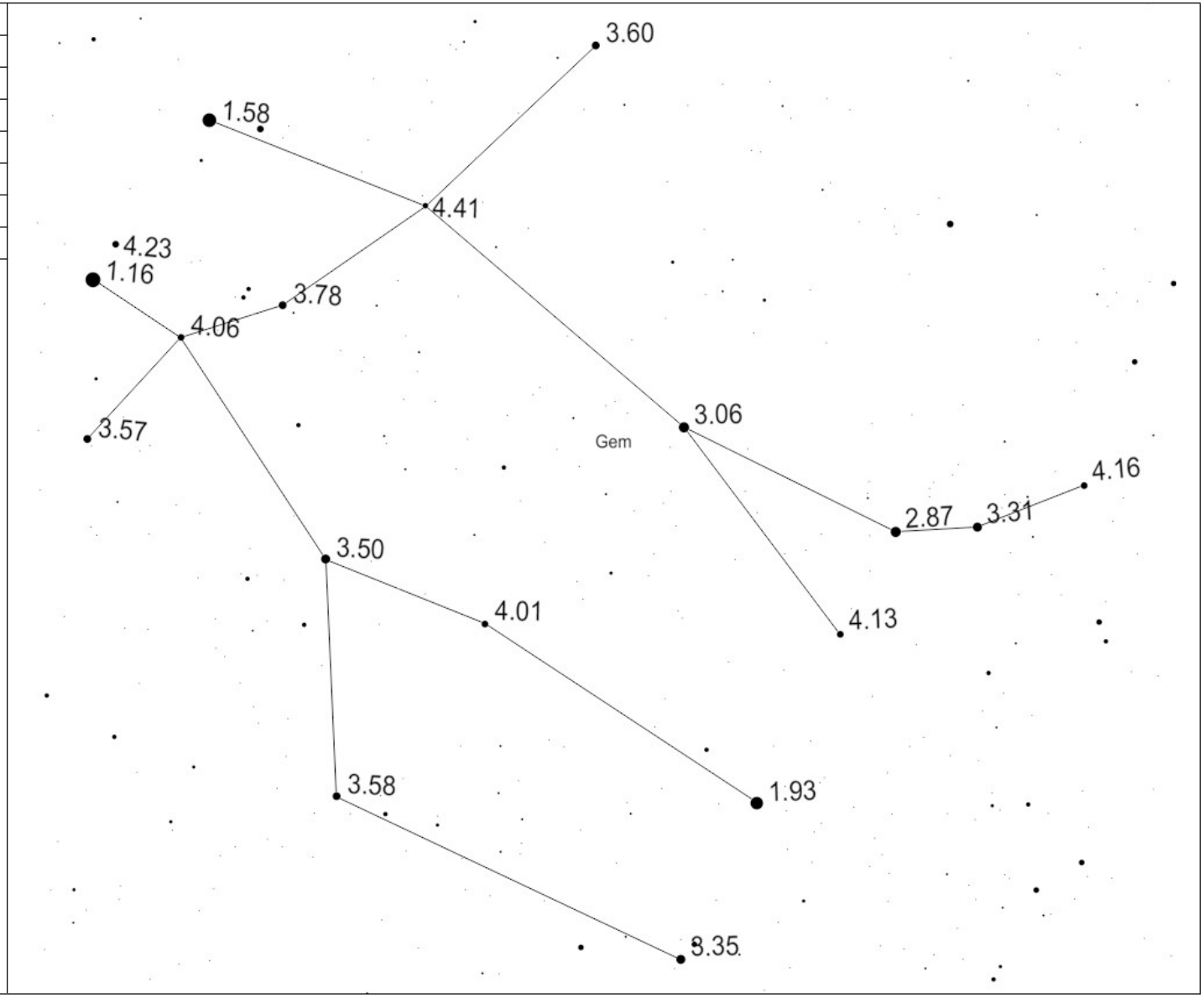


Chart A3 RA 8h Gemini Limiting Magnitude

Transparency	Limiting Magnitude
1	Magnitude 1.5
2	Magnitude 2
3	Magnitude 3
4	Magnitude 4
5	Magnitude 4.5
6	Magnitude 5
7	Magnitude 5.5+

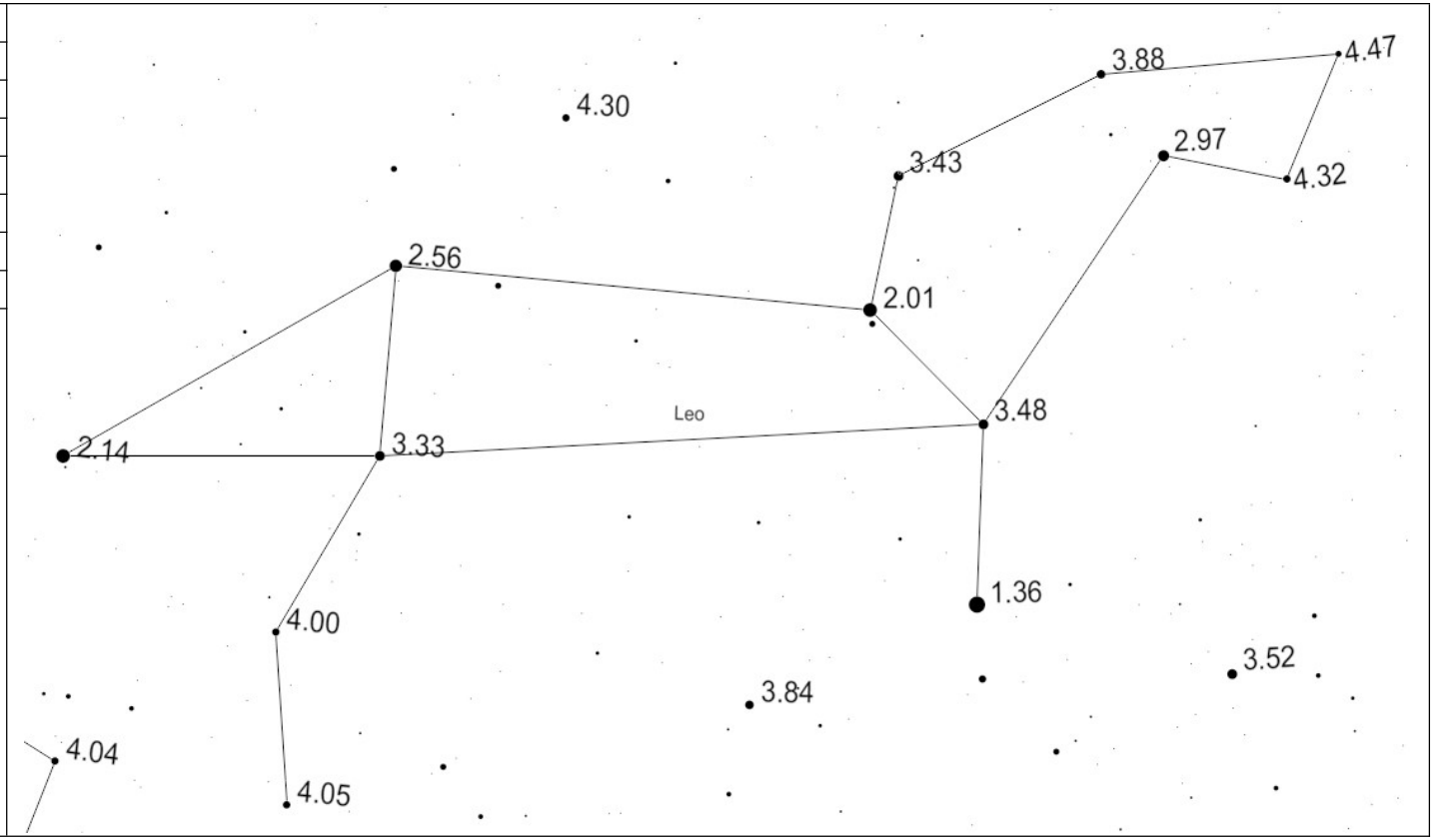


Chart A4 RA 11h Leo Limiting Magnitude

Transparency	Limiting Magnitude
1	Magnitude 1.5
2	Magnitude 2
3	Magnitude 3
4	Magnitude 4
5	Magnitude 4.5
6	Magnitude 5
7	Magnitude 5.5+

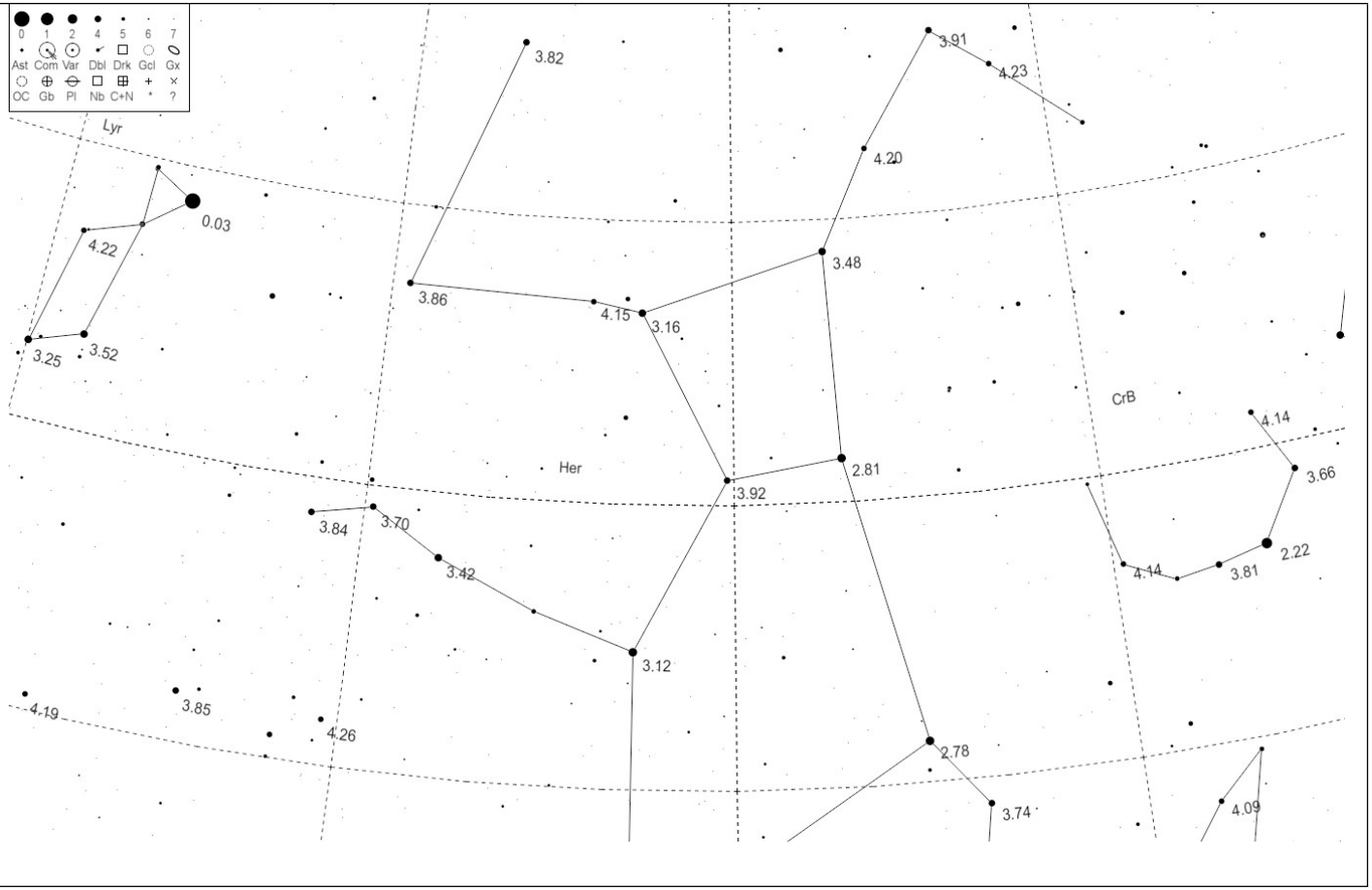


Chart A5 RA 17h Hercules, Lyra Limiting Magnitude

Welcome to the Astronomical League's Carbon Star Observing Program!

Carbon stars are a unique and interesting type of variable star that exhibits peculiar characteristics and spectra. Most are red giant stars, and their distinguishing feature (and namesake) is the unusually high level of carbon molecules contained in their atmospheres. They are fascinating objects to observe, as their appearance may change dramatically during the course of their variation period. While these stars are popularly known for their striking red color, there is a wide range of possible hues that they may display. For the long-period variables or for those with large magnitude ranges, the apparent color may vary from yellow or orange at maximum to deep orange or red at minimum. The stars with shorter periods may remain at an almost constant color, and they often appear pale yellow or white.

While these stars are relatively little-known in comparison to the brighter and more famous galaxies and nebulae, their vivid colors are unparalleled by most other observable objects. This distinctiveness, combined with their unusual characteristics, makes them fascinating subjects for observation, and we hope that through this program you will discover and enjoy these intriguing features for yourself.

Quick View of Requirements	
Carbon Star Observing Program	
Tools Used (Eyes (E), Binoculars (B), Telescopes (T))	T
Manual (M) / Device Aided (DA)	M / DA
Remote Telescopes Allowed	Yes
Visual (V) / Imaging (I)	V / I
Number of Levels	1
Number of Observations	100
Must be an AL Member	Yes
Recommended Minimum Instrument Size	8 inch
Date Deadline for Submission	No
Special Equipment Required	No
Equipment Must Be Constructed	No
Observations Must Be Submitted to an On-Line Database	No

Astronomical League Observing Programs

The Observing Programs of the Astronomical League offer encouragement and certificates of accomplishment for observers demonstrating skills with a variety of instruments and objects. Each program offers a certificate based upon achieving certain observing goals. These are usually in the form of a specific number of objects of a specific group with a given type of instrument. Occasionally there are multiple levels of accomplishment within the program. There is generally no time limit for completing the required observing, but good record keeping is required. When you have observed the required number of objects, your observing logs will be examined and, if they are acceptable, you will receive a certificate. In some programs, you will also get a pin to proclaim to all that you have reached your goal. Many local astronomical societies post lists of those who have obtained certificates on their web sites or in club publications.

The Astronomical League Observing Programs as of this printing:

Active Galactic Nuclei
Advanced Binocular Double Star
Advanced Observer Award
Analemma
Arp Peculiar Galaxies – Northern
Arp Peculiar Galaxies – Southern
Asterism
Asteroid
Astronomy Before the Telescope
Beyond Polaris
Binocular Double Stars
Binocular Master Observer Award
Binocular Messier
Binocular Variable Stars
Bright Nebulae
Caldwell
Carbon Star
Citizen Science Observing Program
Comet
Constellation Hunter – Northern Skies
Constellation Hunter – Southern Skies
Dark Nebulae
Dark Sky Advocate Award
Deep Sky Binocular
Double Star
Earth Orbiting Satellite
Flat Galaxy
Galaxy Groups & Clusters
Galileo
Galileo's T.O.E.S.
Globular Cluster
Herschel Society
Herschel 400
Herschel II
Hydrogen Alpha Solar
Local Galaxy Group and Neighborhood
Lunar
Lunar II
Mars
Master Observer Award
Master Observer Award – Silver
Master Observer Award – Gold
Master Observer Award – Platinum
Messier
Meteor
Multiple Star
NASA Observing Challenges
NEO
Nova
Observer Award
Occultation
Open Cluster
Outreach Award
Planetary Nebulae – Northern
Planetary Nebulae – Southern
Planetary Transit Special Awards
Radio Astronomy
Sketching Award
Sky Puppy
Solar Eclipse Special Award
Solar System
Southern Skies Binocular
Southern Sky Telescope
Spectroscopy
Stellar Evolution
Sunspotters
Two in the View
Universe Sampler
Urban Observing
Variable Star