

Astronomical League

Double Star Certificate - Observing List

“100 of the finest double and multiple stars in the heavens.”

**The double star list contained in this book was compiled by:
The Astronomical League**

For more information visit
<http://www.astroleague.org/>

**The star charts in this book were generated using
Cartes du Ciel
Sky Charts: Free Astronomy Software**

For more information and to download visit
<http://www.stargazing.net/astropc/>

**This book was put together by
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For the *free* use of the Centre's members**

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Introduction

Welcome to the Astronomical League's Double Star Club. The purpose of the Double Star Club is to introduce observers to 100 of the finest double and multiple stars in the heavens. You don't need a large, expensive apochromatic refractor to view the objects on this list since a small refractor, Newtonian reflector, or Schmidt-Cassegrain will do just fine. All objects on this list were observed with a three inch refractor using between 75X and 150X. Again, this program is meant to allow you to enjoy a different aspect of our wonderful hobby, and not to test your equipment.

Double star observing can be very forgiving. You don't need the darkest skies, the clearest skies, or even a moonless night to observe many of these objects. Some can be observed from your backyard under moderate light pollution, some can be observed under less than transparent skies, and some can even be observed with the moon up. However, as usual in astronomy, the best results can be obtained under optimum conditions. The point is, always try for the best conditions, but if you don't have them, don't worry about it. You can still enjoy this program.

Rules and Regulations

To qualify for the AL's Double Star Certificate and pin, you need only be a member of the Astronomical League, either through an affiliated club or as a Member-at-Large, and observe the 100 selected objects on the included list. Any telescope may be used, but one with an objective 60mm in diameter or larger is recommended. To record your observations, you may use the log sheet provided, or one with similar information. If you use your own log sheets, they should include: object, date, time, power, seeing, instrument, and a drawing of the double or multiple system. Yes, I said a drawing of the double star. Now, before you panic, how hard is it to draw two dots in the box provided, with the size of the dot indicating magnitude, and the distance between the dots representing separation? I have given you a line for a description, but this is optional and not required. I have included this so that if you are inspired by any one double star, you can write your thoughts or feelings down for later reference.

You must be a member of the Astronomical League to receive this certificate. If you are not a member now, click here to view information on membership in our organization.

To receive your Double Star Certificate and pin, simply send your observations along with your name, address, phone number, and society affiliation, either to your society's Awards Co-ordinator for verification, or to:

Mike Benson
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Upon verification of your observations, your certificate and pin will be forwarded either to you or your society's Awards Co-ordinator, whomever you choose.

For information on which double stars to observe, read the Double Star Observing list and record your observations on the log sheet.

*This page was reproduced from the Astronomical League website.
<http://www.astroleague.org/al/obsclubs/dblstar/dblstar1.html>*

Notes on Observing Double Stars:

By Brian Battersby

Separation:

One arcminute (') = $1/60^{\text{th}}$ of a degree
One arcsecond (") = $1/60^{\text{th}}$ of an arcminute

Examples:

Alcor and Mizar (Zeta Ursa Majoris) are separated by 12'
Mizar A & B (Zeta Ursa Majoris) are separated by 14.4"
Alberio (Beta Cygni) is separated by 34.4"

Push Your Telescope To Its Limit:

The diameter of mirror, seeing conditions, quality of optics and experience of the observer all play a role in determining how close a pair you will be able to split. The theoretical separation limit for a given telescope, or Dawes Limit, can be derived using the following formula:

$$S = 4.6 / D \text{ (in inches)} \quad \text{or} \quad S = 11.7 / D \text{ (in centimetres)}$$

S stands for arcseconds (").

D stands for the diameter of your primary mirror.

Examples:

4" telescope will split doubles down to 1.15"
6" telescope will split doubles down to 0.76"
8" telescope will split doubles down to 0.575"

Magnification:

A rule of thumb for determining what magnification is needed to split the double is:

$$X = 240 / S$$

X stands for magnification

S stands for arcseconds (")

Examples:

Alcor & Mizar split with 0.33x (notice it is less than 1x therefore it can be split with the naked eye)
Mizar A & B require about 16.6x to split
Alberio splits at 7x.

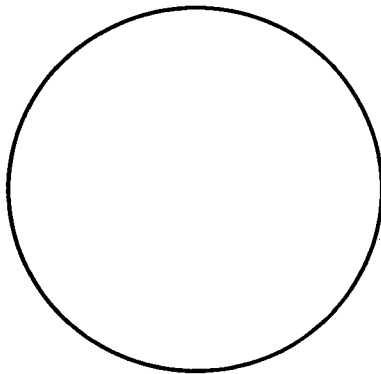
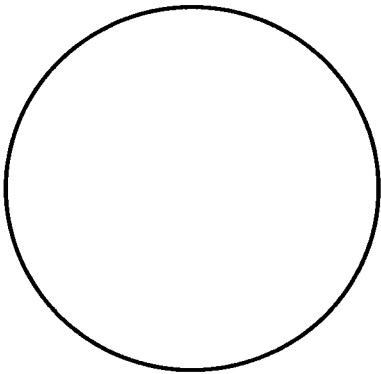
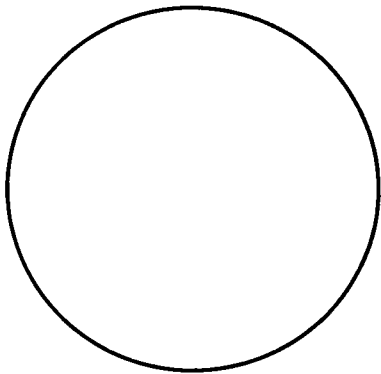
Position Angle:

The Position Angle (PA) of a pair is determined by the orientation of the dimmer star to the brighter star as measured from north.

0 = North	90 = East
180 = South	270 = West

Don't forget that the view in your telescope may be mirror imaged depending on its configuration. An easy way to determine north is to bump the telescope towards Polaris and watch in the eyepiece to see which way the star moves. To determine which direction is west in the eyepiece simply watch the star drift through the eyepiece without any type of tracking employed. Stars, like the Sun, move from east to west across the sky.

SESSION INFORMATION					
Start Date	Start Time	Location	Trans. (1-5)	Seeing (1-7)	Limiting Mag
End Date	End Time	Conditions			
Instrument Used:					
OBJECT INFORMATION					
Object	Time	Notes	Magnification		



Double Star Observing List (Epoch 2000.0)

	Object	Right Ascension	Declination	Magnitude	Separation	Position Angle
[]	Eta Cassiopeiae	00 ^h 49 ^m .1	+57° 49'	3.4, 7.5	12"	307°
[]	65 Piscium	00 ^h 49 ^m .9	+27° 43'	6.3, 6.3	4.4"	297°
[]	Psi 1 Piscium	01 ^h 05 ^m .6	+21° 28'	5.6, 5.8	30"	159°
[]	Zeta Piscium	01 ^h 13 ^m .7	+07° 35'	5.6, 6.5	23"	63°
[]	Gamma Arietis	01 ^h 53 ^m .5	+19° 18'	4.8, 4.8	7.8"	0°
[]	Lambda Arietis	01 ^h 57 ^m .9	+23° 36'	4.9, 7.7	37"	46°
[]	Alpha Piscium	02 ^h 02 ^m .0	+02° 46'	4.2, 5.1	1.7"	50°
[]	Gamma Andromedae	02 ^h 03 ^m .9	+42° 20'	2.3, 5.5	9.8"	63°
[]	Iota Trianguli	02 ^h 12 ^m .4	+30° 18'	5.3, 6.9	3.9"	71°
[]	Alpha Ursa Minoris	02 ^h 31 ^m .8	+89° 16'	2.0, 9.0	18.4"	218°
[]	Gamma Ceti	02 ^h 43 ^m .3	+03° 14'	3.5, 7.3	2.8"	294°
[]	Eta Persei	02 ^h 50 ^m .7	+55° 54'	3.8, 8.5	28.3"	300°
[]	Struve 331	03 ^h 00 ^m .9	+52° 21'	5.3, 6.7	12.1"	85°
[]	32 Eridani	03 ^h 54 ^m .3	-02° 57'	4.8, 6.1	6.8"	347°
[]	Chi Tauri	04 ^h 22 ^m .6	+25° 38'	5.5, 7.6	19.4"	24°
[]	1 Camelopardalis	04 ^h 32 ^m .0	+53° 55'	5.7, 6.8	10.3"	308°
[]	55 Eridani	04 ^h 43 ^m .6	-08° 48'	6.7, 6.8	9.2"	317°
[]	Beta Orionis	05 ^h 14 ^m .5	-08° 12'	0.1, 6.8	9.5"	202°
[]	118 Tauri	05 ^h 29 ^m .3	+25° 09'	5.8, 6.6	4.8"	204°
[]	Delta Orionis	05 ^h 32 ^m .0	-00° 18'	2.2, 6.3	52.6"	359°
[]	Struve 747	05 ^h 35 ^m .0	-06° 00'	4.8, 5.7	35.7"	223°
[]	Lambda Orionis	05 ^h 35 ^m .1	+09° 56'	3.6, 5.5	4.4"	43°
[]	Theta 1 Orionis	05 ^h 35 ^m .3	-05° 23'	6.7, 7.9, 5.1, 6.7	8.8", 13", 21.5"	31°, 132°, 96°
[]	Iota Orionis	05 ^h 35 ^m .4	-05° 55'	2.8, 6.9	11.3"	141°
[]	Theta 2 Orionis	05 ^h 35 ^m .4	-05° 25'	5.2, 6.5	52"	92°
[]	Sigma Orionis	05 ^h 38 ^m .7	-02° 36'	4.0, 7.5, 6.5	12.9", 43"	84°, 61°

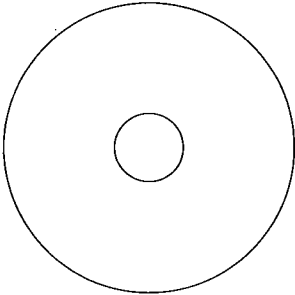
[]	Zeta Orionis	05 ^h 40 ^m .8	-01° 57'	1.9, 4.0, 9.9	2.4", 58"	162°, 10°
[]	Gamma Leporis	05 ^h 44 ^m .5	-22° 27'	3.7, 6.3	96"	350°
[]	Theta Aurigae	05 ^h 59 ^m .7	+37° 13'	2.6, 7.1	3.6"	313°
[]	Epsilon Monocerotis	06 ^h 23 ^m .8	+04° 36'	4.5, 6.5	13.4"	27°
[]	Beta Monocerotis	06 ^h 28 ^m .8	-07° 02'	4.7, 5.2	7.3"	132°
[]	12 Lyncis	06 ^h 46 ^m .2	+59° 27'	5.4, 7.3	8.7"	308°
[]	Epsilon Canis Majoris	06 ^h 58 ^m .6	-28° 58'	1.5, 7.4	7.5"	161°
[]	Delta Geminorum	07 ^h 20 ^m .1	+21° 59'	3.5, 8.2	6.8"	211°
[]	19 Lyncis	07 ^h 22 ^m .9	+55° 17'	5.6, 6.5	14.8"	315°
[]	Alpha Geminorum	07 ^h 34 ^m .6	+31° 53'	1.9, 2.9	2.2"	171°
[]	Kappa Puppis	07 ^h 38 ^m .8	-26° 48'	4.5, 4.7	9.9"	318°
[]	Zeta Cancri	08 ^h 12 ^m .2	+17° 39'	5.6, 6.0	5.9"	89°
[]	Iota Cancri	08 ^h 46 ^m .7	+28° 46'	4.2, 6.6	30"	307°
[]	38 Lyncis	09 ^h 18 ^m .8	+36° 48'	3.9, 6.6	2.7"	229°
[]	Alpha Leonis	10 ^h 08 ^m .4	+11° 58'	1.4, 7.7	177"	307°
[]	Gamma Leonis	10 ^h 20 ^m .0	+19° 51'	2.2, 3.5	4.4"	122
[]	54 Leonis	10 ^h 55 ^m .6	+24° 45'	4.5, 6.3	6.5"	110°
[]	N Hydrae	11 ^h 32 ^m .3	-29° 16'	5.8, 5.9	9.2"	210°
[]	Delta Corvi	12 ^h 29 ^m .9	-16° 31'	3.0, 9.2	24.2"	214°
[]	24 Comae Berenices	12 ^h 35 ^m .1	+18° 23'	5.2, 6.7	20.3"	271°
[]	Gamma Virginis	12 ^h 41 ^m .7	-01° 27'	3.5, 3.5	3.6"	293°
[]	32 Camelopardalis	12 ^h 49 ^m .2	+83° 25'	5.3, 5.8	21.6"	326°
[]	Alpha Canum Venaticorum	12 ^h 56 ^m .0	+38° 19'	2.9, 5.5	19.4"	229°
[]	Zeta Ursa Majoris	13 ^h 23 ^m .9	+54° 56'	2.3, 4.0, 4.0	14.4", 709"	152°, 71°
[]	Kappa Bootis	14 ^h 13 ^m .5	+51° 47'	4.6, 6.6	13.4"	236°
[]	Iota Bootis	14 ^h 16 ^m .2	+51° 22'	4.9, 7.5	38"	33°
[]	Pi Bootis	14 ^h 40 ^m .7	+16° 25'	4.9, 5.8	5.6"	108°
[]	Epsilon Bootis	14 ^h 45 ^m .0	+27° 04'	2.5, 4.9	2.8"	339°
[]	Alpha Librae	14 ^h 50 ^m .9	-16° 02'	2.8, 5.2	231"	314°

[]	Xi Bootis	14 ^h 51 ^m .4	+19° 06'	4.7, 7.0	6.9"	332°
[]	Delta Bootis	15 ^h 15 ^m .5	+33° 19'	3.5, 8.7	105"	79°
[]	Mu Bootis	15 ^h 24 ^m .5	+37° 23'	4.3, 7.0	108"	171°
[]	Delta Serpentis	15 ^h 34 ^m .8	+10° 32'	4.2, 5.2	3.9"	178°
[]	Zeta Corona Borealis	15 ^h 39 ^m .4	+36° 38'	5.1, 6.0	6.3"	305°
[]	Xi Scorpii	16 ^h 04 ^m .4	-11° 22'	4.8, 7.3	7.6"	51°
[]	Struve 1999	16 ^h 04 ^m .4	-11° 27'	7.4, 8.1	11.6"	99°
[]	Beta Scorpii	16 ^h 05 ^m .4	-19° 48'	2.6, 4.9	13.6"	21°
[]	Kappa Herculis	16 ^h 08 ^m .1	+17° 03'	5.3, 6.5	28"	12°
[]	Nu Scorpii	16 ^h 12 ^m .0	-19° 28'	4.3, 6.4	41"	337°
[]	Sigma Corona Borealis	16 ^h 14 ^m .7	+33° 52'	5.6, 6.6	6.2"	233°
[]	16/17 Draconis	16 ^h 36 ^m .2	+52° 55'	5.4, 6.4, 5.5	3.4, 90	108°, 194°
[]	Mu Draconis	17 ^h 05 ^m .3	+54° 28'	5.7, 5.7	2.0"	42°
[]	Alpha Herculis	17 ^h 14 ^m .6	+14° 23'	3.5, 5.4	4.7"	107°
[]	Delta Herculis	17 ^h 15 ^m .0	+24° 50'	3.1, 8.2	8.9"	236°
[]	36 Ophiuchi	17 ^h 15 ^m .3	-26° 36'	5.1, 5.1	4.4"	154°
[]	Omicron Ophiuchi	17 ^h 18 ^m .0	-24° 17'	5.4, 6.9	10.3"	355°
[]	Rho Herculis	17 ^h 23 ^m .7	+37° 09'	4.6, 5.6	4.1"	316°
[]	Nu Draconis	17 ^h 32 ^m .2	+55° 11'	4.9, 4.9	62"	312°
[]	Psi Draconis	17 ^h 41 ^m .9	+72° 09'	4.9, 6.1	30.3"	15°
[]	40/41 Draconis	18 ^h 00 ^m .2	+80° 00'	5.7, 6.1	19.3"	232°
[]	95 Herculis	18 ^h 01 ^m .5	+21° 36'	5.0, 5.1	6.3"	258°
[]	70 Ophiuchi	18 ^h 05 ^m .5	+02° 30'	4.2, 6.0	2.8"	72°
[]	Epsilon Lyrae	18 ^h 44 ^m .3	+39° 40'	5.0, 6.1, 5.2, 5.5	208", 2.6", 2.3"	357°, 173°, 94°
[]	Zeta Lyrae	18 ^h 44 ^m .8	+37° 36'	4.3, 5.9	44"	150°
[]	Beta Lyrae	18 ^h 50 ^m .1	+33° 22'	3.4, 8.6	46"	149°
[]	Struve 2404	18 ^h 50 ^m .8	+10° 59'	6.9, 8.1	3.6"	183°
[]	Otto Struve 525	18 ^h 54 ^m .9	+33° 58'	6.0, 7.7	45"	350°
[]	Theta Serpentis	18 ^h 56 ^m .2	+04° 12'	4.5, 5.4	22.3"	104°
[]	Beta Cygni	19 ^h 30 ^m .7	+27° 58'	3.1, 5.1	34.4"	54°

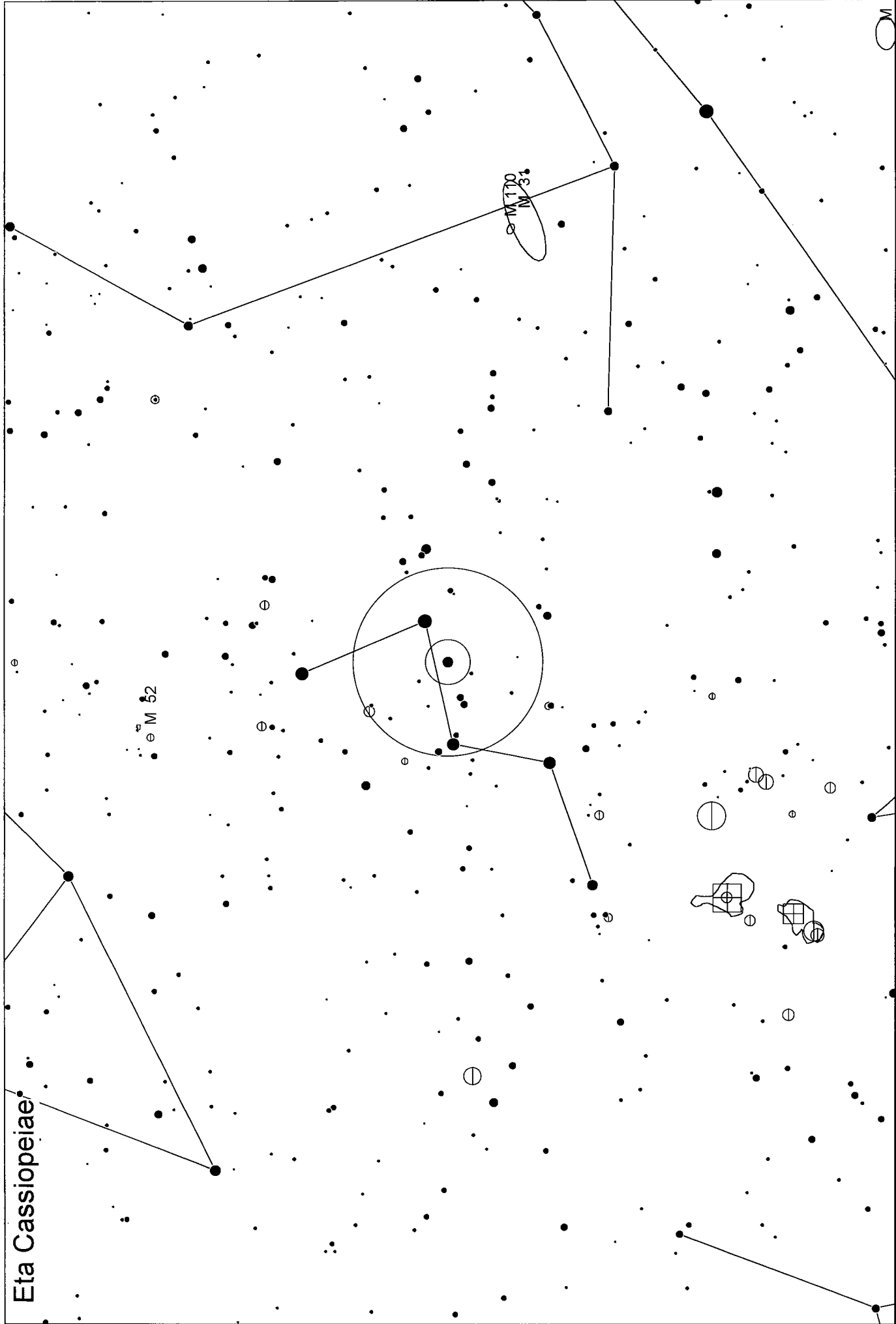
[]	57 Aquilae	19 ^h 54 ^m .6	-08° 14'	5.8, 6.5	36"	170°
[]	31 Cygni	20 ^h 13 ^m .6	+46° 44'	3.8, 6.7, 4.8	107", 337"	173°, 323°
[]	Alpha Capricornus	20 ^h 18 ^m .1	-12° 33'	3.6, 4.2	378"	291°
[]	Beta Capricornus	20 ^h 21 ^m .0	-14° 47'	3.4, 6.2	206"	267°
[]	Gamma Delphinus	20 ^h 46 ^m .7	+16° 07'	4.5, 5.5	9.6"	268°
[]	61 Cygni	21 ^h 06 ^m .9	+38° 45'	5.2, 6.0	28"	146°
[]	Beta Cephei	21 ^h 28 ^m .7	+70° 34'	3.2, 7.9	13.3"	249°
[]	Struve 2816	21 ^h 39 ^m .0	+57° 29'	5.6, 7.7, 7.8	11.7", 20"	121°, 339°
[]	Epsilon Pegasi	21 ^h 44 ^m .2	+09° 52'	2.4, 8.4	142"	320°
[]	Xi Cephei	22 ^h 03 ^m .8	+64° 38'	4.4, 6.5	7.7"	277°
[]	Zeta Aquarii	22 ^h 28 ^m .8	-00° 01'	4.3, 4.5	1.8"	266°
[]	Delta Cephei	22 ^h 29 ^m .2	+58° 25'	3.9, 6.3	41"	192°
[]	8 Lacerta	22 ^h 35 ^m .9	+39° 38'	5.7, 6.5	22.4"	186°
[]	94 Aquarii	23 ^h 19 ^m .1	-13° 28'	5.3, 7.3	12.7"	350°
[]	Sigma Cassiopeiae	23 ^h 59 ^m .0	+55° 45'	5.0, 7.1	3"	326°

Outer Circle = 7 deg

Inner Circle = 1.4 deg



Eta Cassiopeiae



PGAO 2003-10-11 21h15m C: 0h49m +57°50' L:+49°00' O:0° ARC HZ Cat: DSL BSC SAC
 0h49m06.00s +57°48'57.0" * HR 219 HD 4614 Fl: 24 Ba:Eta const:Cas mV: 3.44 b-v: 0.57 sp: F9V+dM0 pm: 1.100 -0.529 ;Achird
 MAG: 3.4, 7.5 SEP: 12" PA: 307 deg

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

65 Piscium

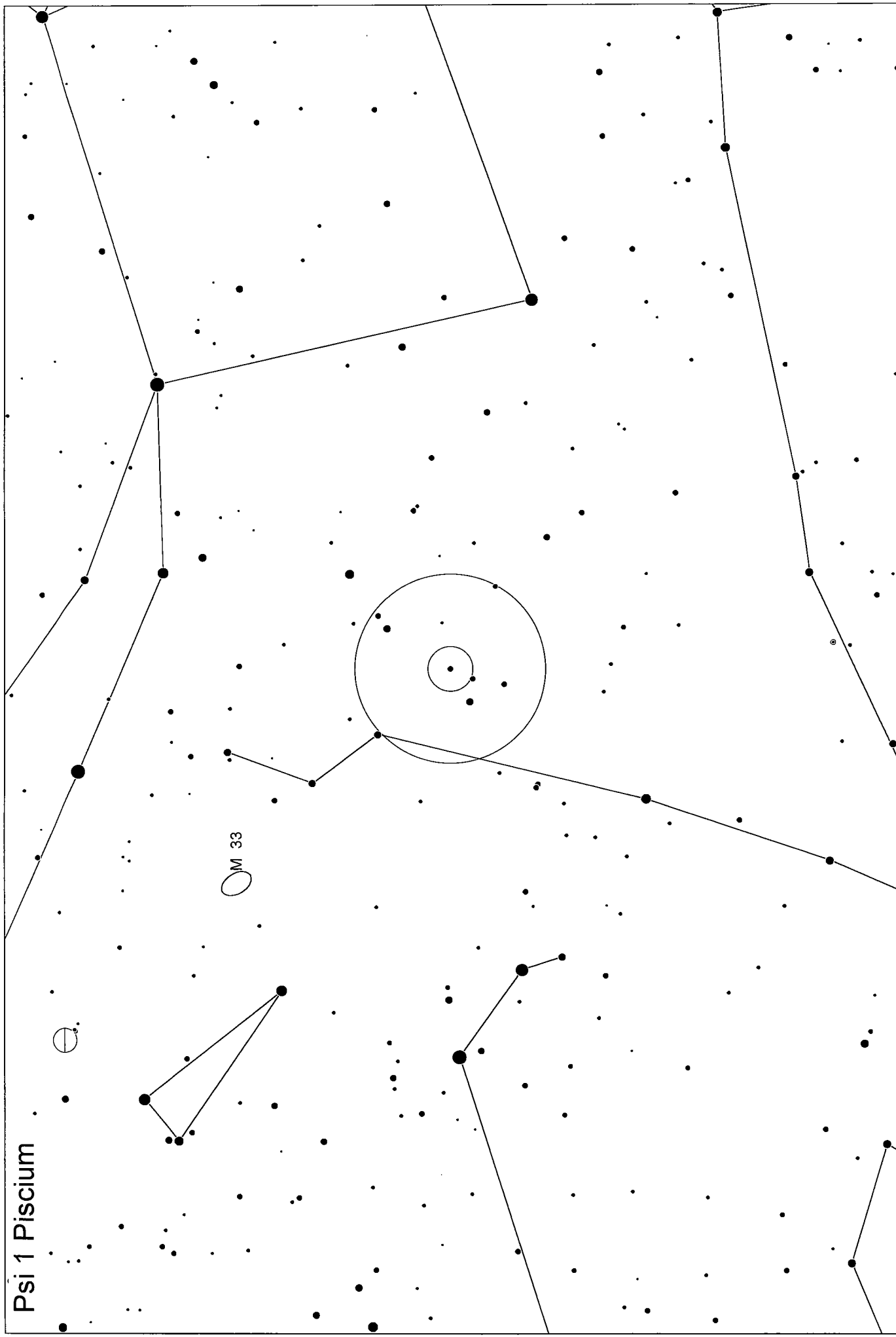
pm: 0.084 -0.010

⑨

×
+
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+C Star Unk

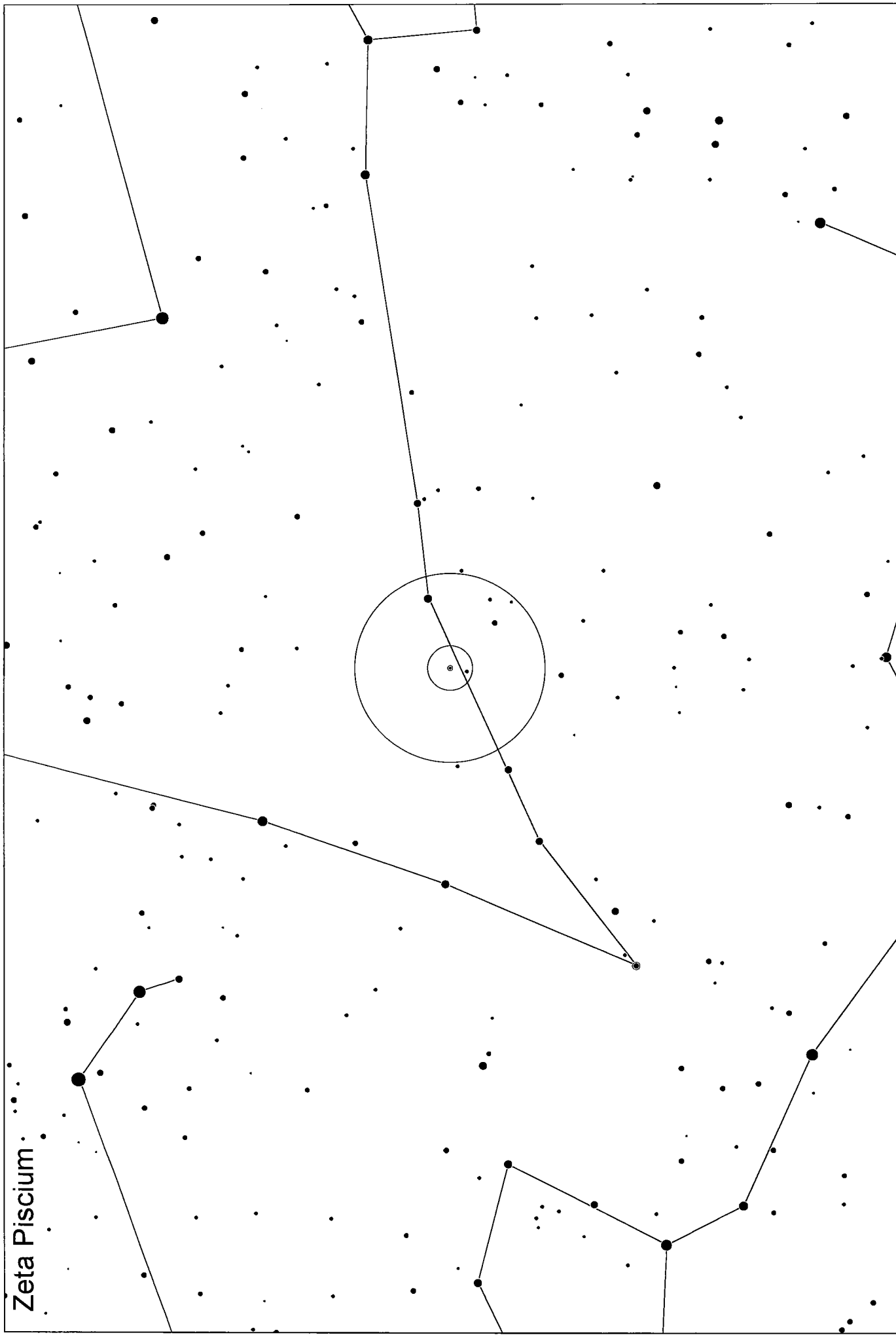
Psi 1 Piscium



PGAO 2003-10-11 0h14m C: 1h06m +21°29' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
 1h13m43.90s +07°34'31.0" * HR 361 HD 7344 Fl: 86 BaZet const: Psc mV: 5.24 b-v: 0.32 sp: A7IV
 MAG: 5.6, 5.8 SEP: 30" PA: 159 deg pm: 0.144 -0.056

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

Zeta Piscium



PGO 2003-10-11 0h14m C: 1h14m +07°36' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
 1h13m43.90s +07°34'31.0" * HR 361 HD 7344 Fl: 86 Ba: Zet const: Psc mV: 5.24 b-v: 0.32 sp: A7IV
 MAG: 5.6, 6.5 SEP: 23" PA: 63 deg pm: 0.144 -0.056

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

Gamma Arietis

OM 33

PGAO 2003-10-11 0h14m C: 1h54m +19°19' L: +49°00' O:0° ARC HZ Cat: DSL BSC SAC
 1h53m31.80s +19°17'37.0" * HR 546 HD 11502 Fl: 5 Ba:Gam2 const:Ari mV: 4.75 b-v:-0.04 sp: A1pSI
 MAG: 4.8, 4.8 SEP: 7.8" PA: 0 deg

pm: 0.079 -0.104 ,Mesarthim; Mesarthim; First Star in Aries

Magnitude: 0 1 2 3 4 5 6	Variable	Double	Comet	Asteroid	Planet
Gx Oc Gc Pl Neb N+C Star Unk	+	+	+	+	+

Lambda Arietis.

⊖ M 34

⊖ M 33

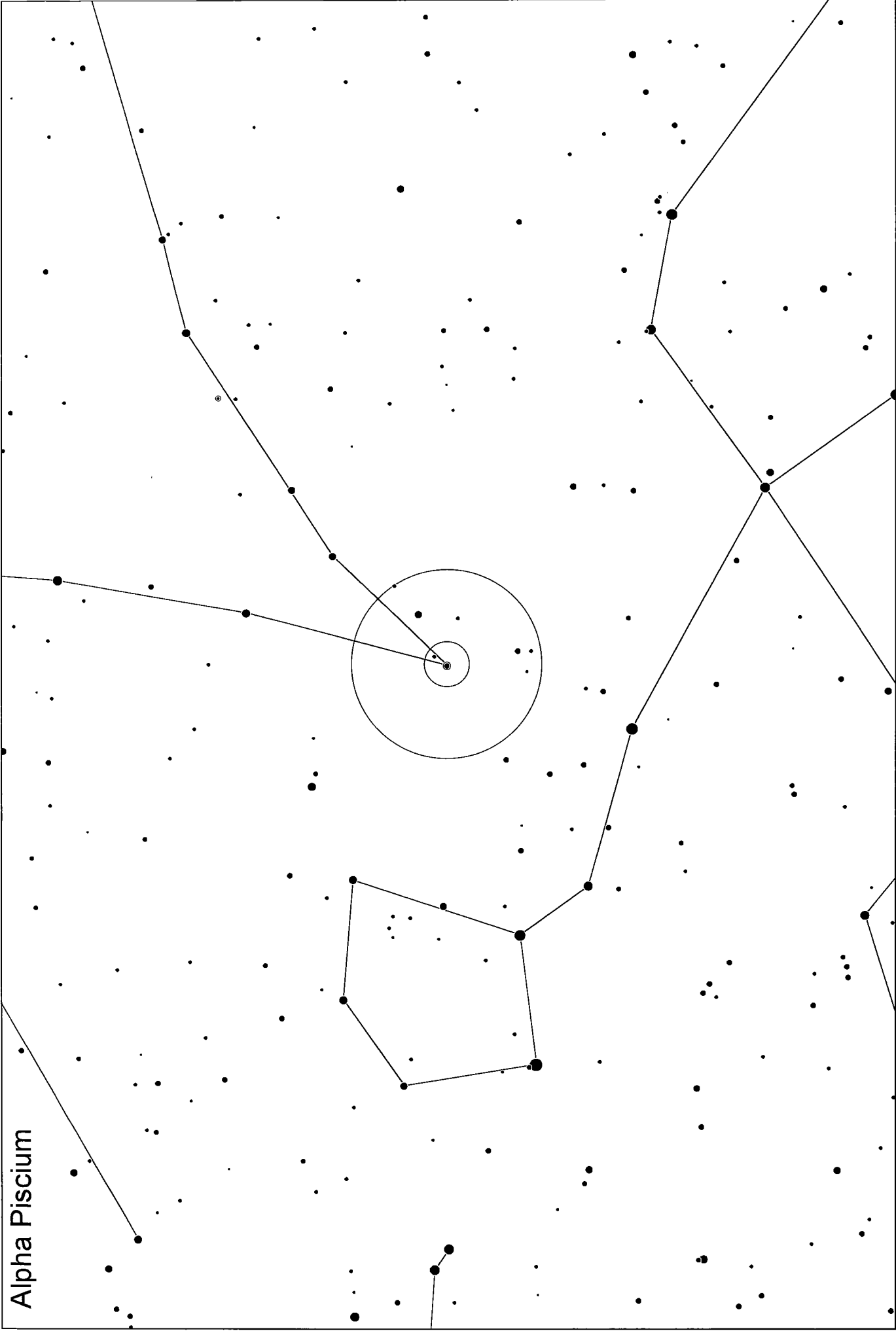
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PGAO 2003-10-11 0h14m C: 1h58m +23°37' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
1h57m55.70s +23°35'46.0" * HR 569 HD 11973 Fl: 9 Ba: Lam const: Ari mV: 4.79 b-v: 0.28 sp: F0V
MAG: 4.9, 7.7 SEP: 37" PA: 46 deg

pm: -0.090 -0.013

Magnitude: 0 1 2 3 4 5 6						Variable	Double	Comet	Asteroid	Planet
●	●	●	●	●	●	⊙	●	☄	◆	♃
○	⊕	⊕	○	□	⊠	+	×			
Nebula: Gx Oc Gc Pl Neb N+C Star Unk										

Alpha Piscium



PGAO 2003-10-11 0h14m C: 2h02m +02°46' L:+49°00' O:0° ARC HZ Cat: DSL BSC SAC
 6h48m11.40s -61°56'29.0" * HR 2550 HD 50241 Fl: Ba:Alp const:Pic mV: 3.27 b-v: 0.21 sp: A7IV pm:-0.069 0.269
 MAG: 4.2, 5.1 SEP: 1.7" PA: 50 deg

Magnitude: 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

This is a detailed astronomical chart of the constellation Gamma Andromedae. The chart features a dense field of stars, with the primary star, Gamma Andromedae (α), prominently displayed at the center. Several Messier objects are clearly marked and labeled: M 31 (the Andromeda Galaxy) is located in the upper left quadrant, M 33 (the Triangulum Galaxy) is in the upper right, and M 34 (the Beehive Cluster) is in the lower right. The constellation's boundaries are delineated by lines connecting the main stars. The chart is labeled 'Gamma Andromedae' in the bottom left corner.

pm: 0.045 -0.052 ;ALMAAK; Almach; Alamak; Almak; Almaach

MAG: 2.3, 5.5 SEP: 9.8" PA: 63 deg

Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk
	○	⊖	⊕	○	□	⊞	+	x

Alpha Ursa Minoris

2h31m48.70s +89°15'51.0" * HR 424 HD 8890 Fl: 1 Ba: Alp const: UMI mV: 2.02 b-v: 0.60 sp: 0.00
 MAG: 2.0 0.0 SED: 19.4" RA: 219 deg

Magnitude	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
												

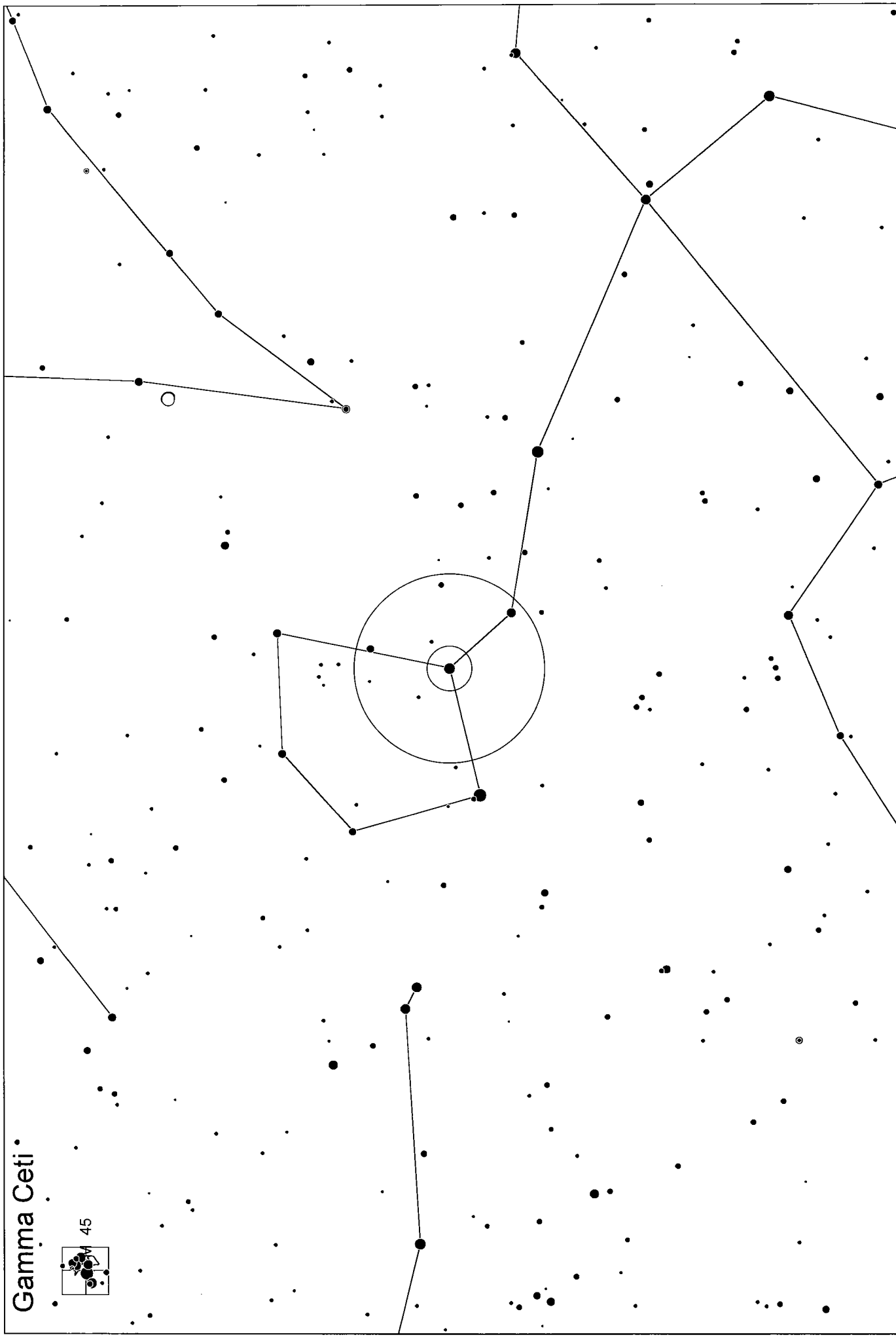
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk
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1000

Gamma Ceti



45



PGAO 2003-10-11 0h14m C: 2h43m +03°15' L:+49°00' O:0° ARC HZ Cat: DSL BSC SAC		pm:-0.142 -0.152 ;Kaffajidhma; Al Kaff al Jidhmah	
2h43m18.00s +03°14'09.0" * HR 804 HD 16970 Fl: 86 Ba:Gam const:Cet mV: 3.47 b-v: 0.09 sp: A3V			
MAG: 3.5, 7.3 SEP: 2.8" PA: 294 deg			
Magnitude: 0 1 2 3 4 5 6		Variable Double Comet Asteroid Planet	
Nebula: Gx Oc Gc Pl Neb N+C Star Unk			

This is a detailed black and white star chart of the constellation Perseus. The chart displays a wide field of stars, with the primary stars of the constellation connected by lines to form its characteristic shape, including the 'W' of the belt and the 'sword' (a line of stars ending in a small triangle). Key features include:

- Primary Stars:** The stars are represented by black dots of varying sizes, indicating their magnitude. The most prominent stars are connected by lines to form the constellation's outline.
- Star Clusters and Nebulae:** Several specific objects are highlighted with circles or other symbols. One circle is labeled 'M 34'. Another circle is labeled 'Eta Persei'. There are also several circles containing a crosshair or other symbols, likely representing other notable objects in the constellation.
- Orientation:** The chart is oriented with North at the top, as indicated by the 'N' in the top right corner.
- Labels:** The constellation's name 'Perseus' is written in a large, stylized font at the top. The 'W' shape is labeled 'W'. The 'M 34' cluster is labeled 'M 34'. The 'Eta Persei' star is labeled 'Eta Persei'. There are also several other labels for specific stars or objects, such as '1', '2', '3', '4', '5', '6', '7', '8', '9', '10', '11', '12', '13', '14', '15', '16', '17', '18', '19', '20', '21', '22', '23', '24', '25', '26', '27', '28', '29', '30', '31', '32', '33', '34', '35', '36', '37', '38', '39', '40', '41', '42', '43', '44', '45', '46', '47', '48', '49', '50', '51', '52', '53', '54', '55', '56', '57', '58', '59', '60', '61', '62', '63', '64', '65', '66', '67', '68', '69', '70', '71', '72', '73', '74', '75', '76', '77', '78', '79', '80', '81', '82', '83', '84', '85', '86', '87', '88', '89', '90', '91', '92', '93', '94', '95', '96', '97', '98', '99', '100'.

Magnitude: 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
●	●	●	●	●	●	●	⊙	●	☄	◆	♃
○	⊖	⊖	⊕	○	□	□	⊠	+	x		
Nebula: Gx	Gc	Gc	Gc	Pl	Neb	N+C	Star	Unk			

Struve 331

pm: 0.028 -0.026

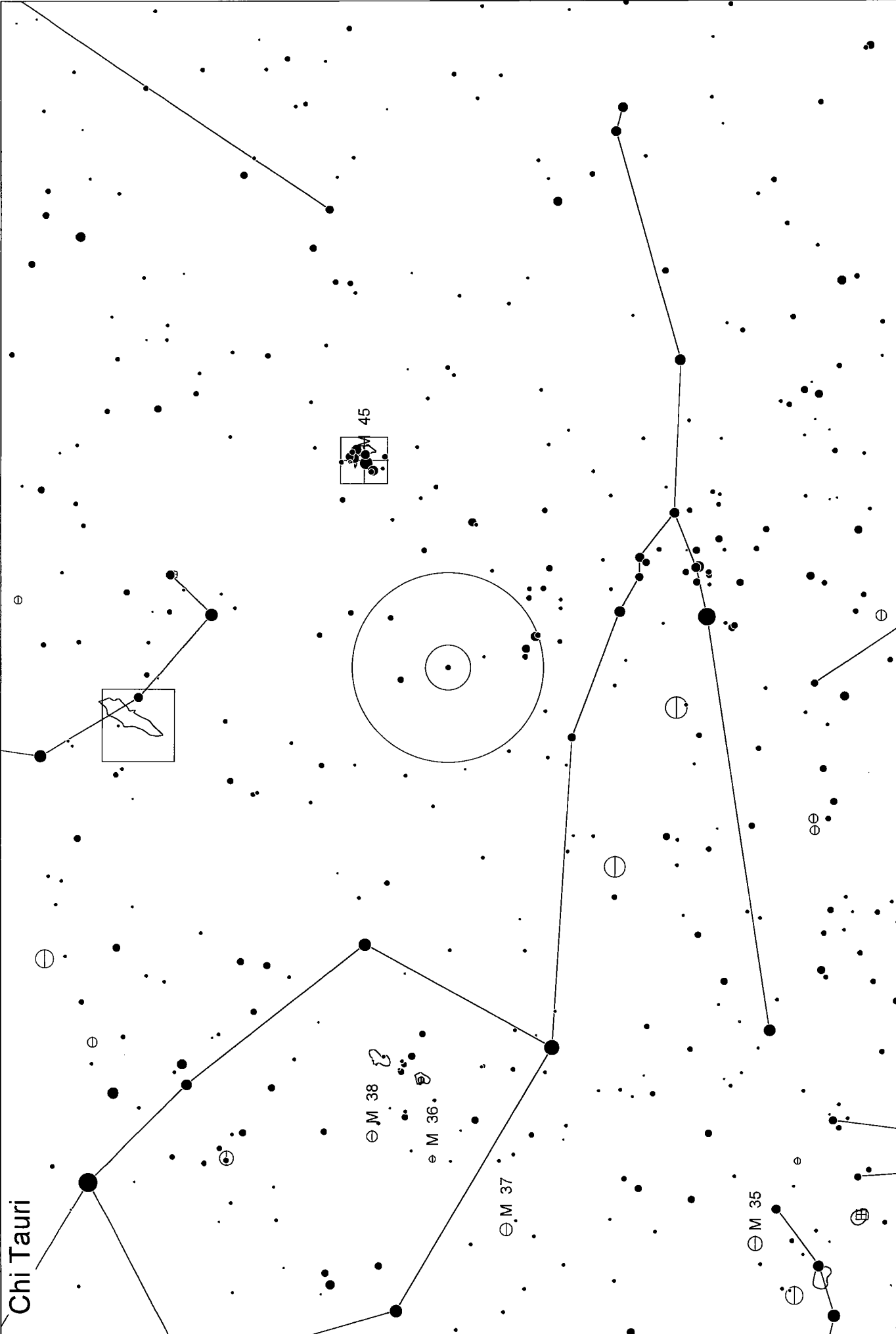
Magnitude: : 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Gx	Gc	Oc	⊕	⊕	○	□	⊠	⊠	+	x	
Nebula: Gx	Gc	Oc	⊕	⊕	○	□	⊠	⊠	+	x	Unk

pm: 0.029 0.002

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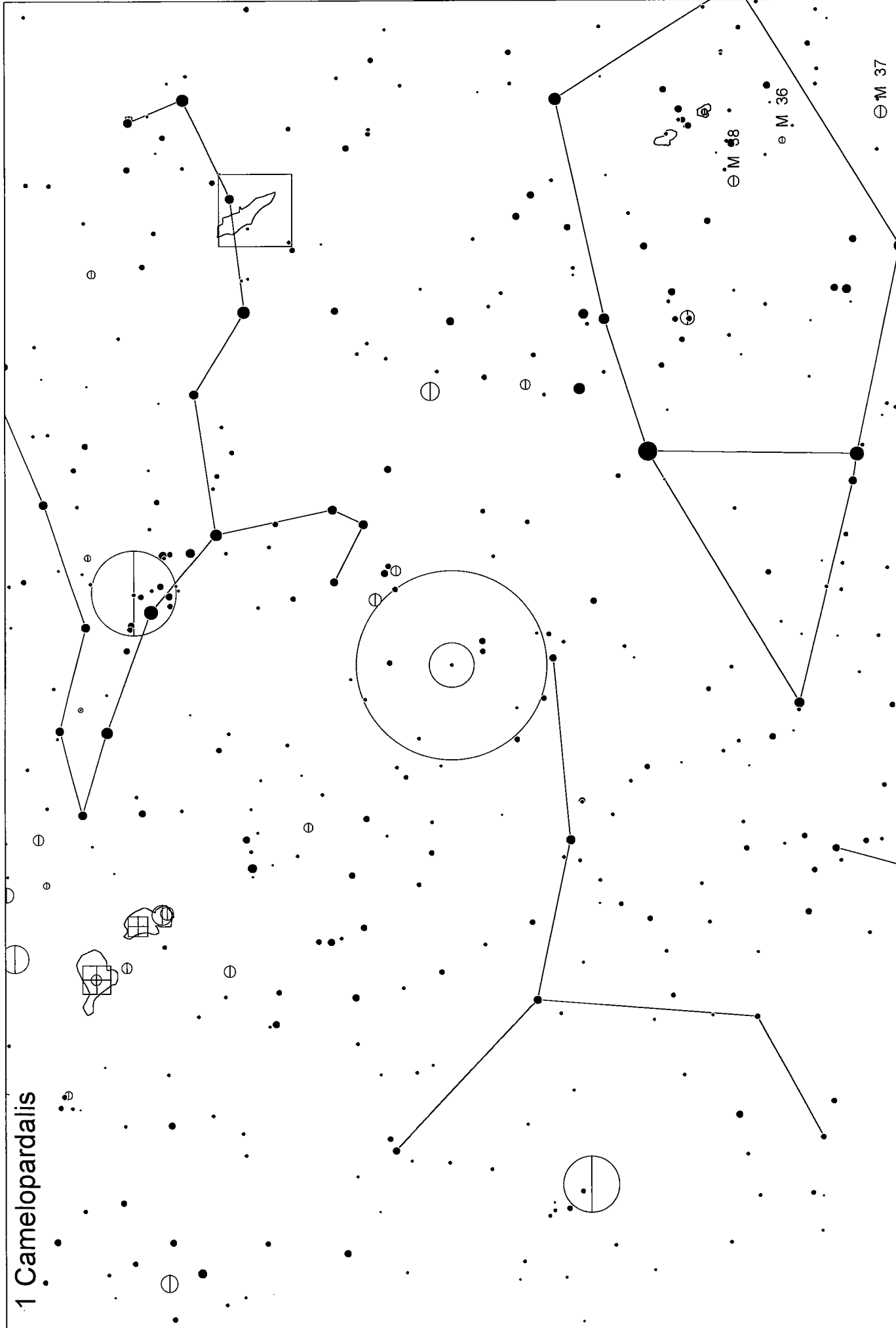
Chi Tauri

PGAO 2003-10-11 2h14m C: 4h23m +25°38' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC

MAG: 5.5, 7.6 SEP: 19.4" PA: 24 deg

Magnitude: : 0 1 2 3 4 5 6						Variable	Double	Comet	Asteroid	Planet
●	●	●	●	●	●	○	●	☄	◆	♃
○	○	○	○	○	○	⊠	+	x		
Nebula: Gx Oc Gc Pl Neb N+C Star Unk										

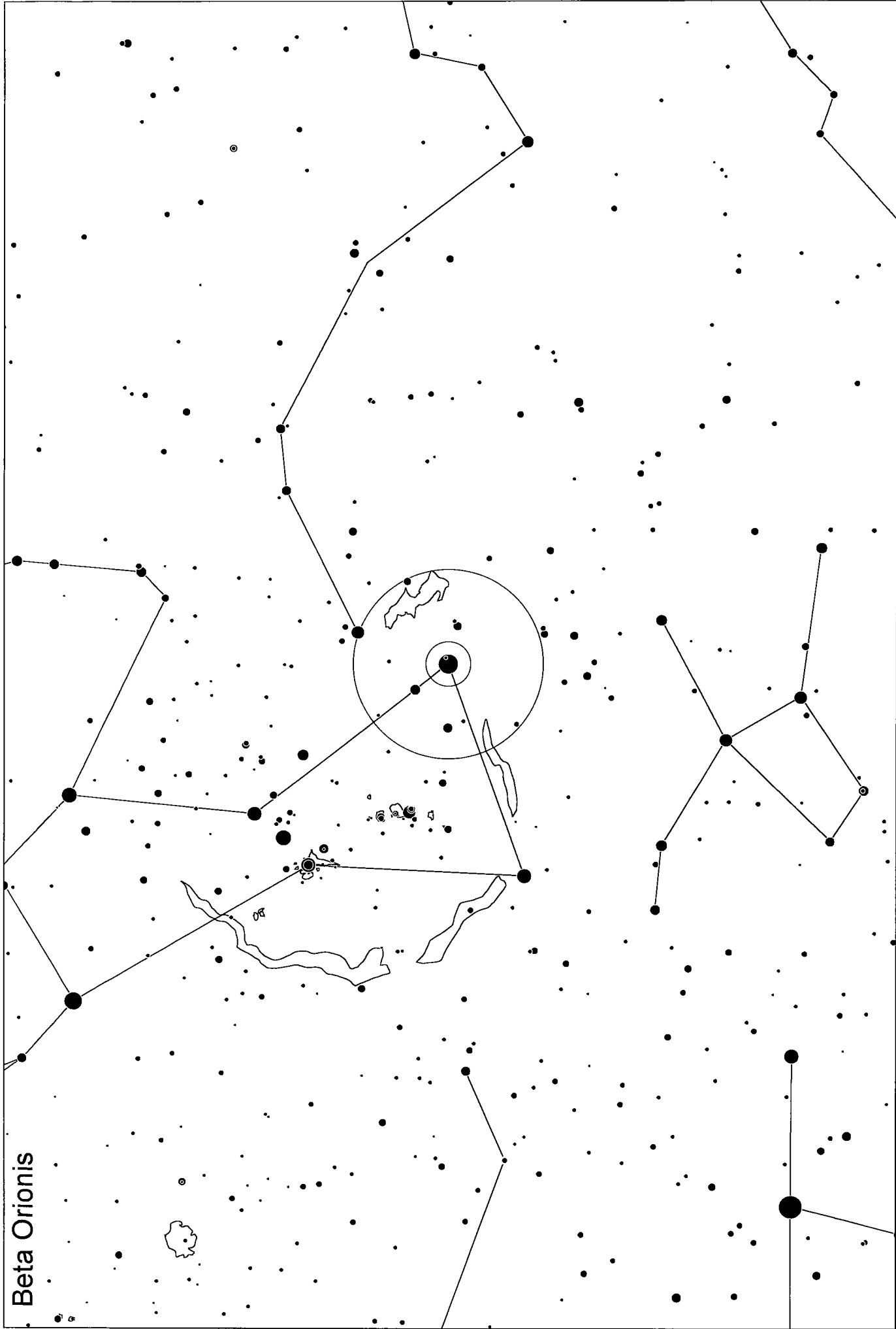
1 Camelopardalis



PGAO 2003-10-11 4h14m C: 4h32m +53°55' L:+49°00' O:0° ARC HZ Cat: DSL BSC SAC
 4h32m01.80s +53°54'39.0" * HR 1417 HD 28446 Fl: 1 Ba: const:Cam mV: 5.77 b-v: 0.18 sp: B0III pm: 0.000 -0.003
 MAG: 5.7, 6.8 SEP: 10.3" PA: 308 deg

Magnitude: 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

Beta Orionis

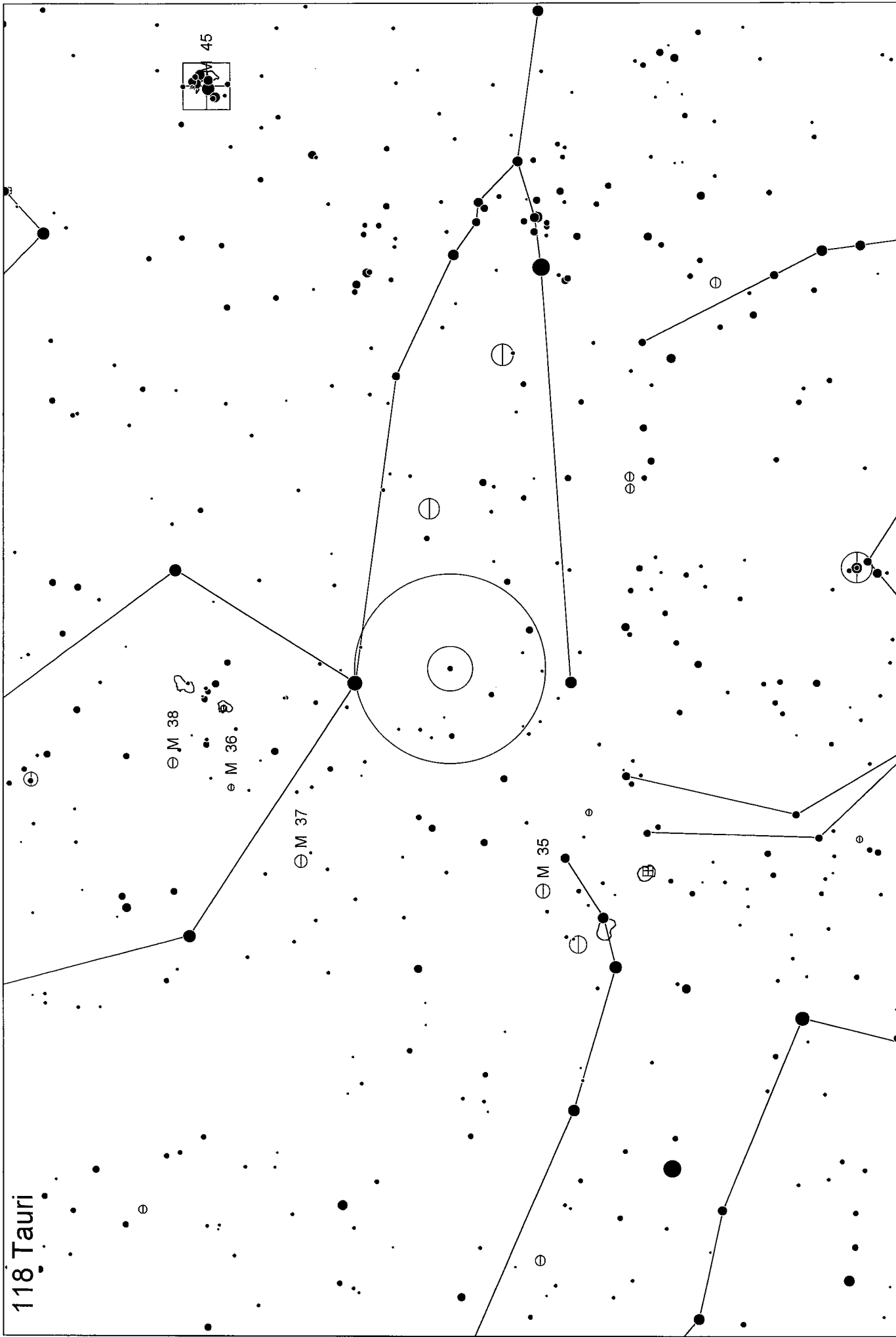
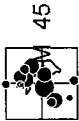


PGAO 2003-10-11 4h14m C: 5h15m -08°12' L: +49°00' O: 0° ARC HZ Cat: DSL BSC
 5h14m32.30s -08°12'06.0" * HR 1713 HD 34085 Fl: 19 Ba: Bet const: Ori mV: 0.12 b-v: -0.03 sp: B8Ia:
 MAG: 0.1, 6.8 SEP: 9.5" PA: 202 deg

pm: 0.000 -0.001 ;RIGEL; Algebar; Elgebar

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	PI	Neb	N+C	Star	Unk				

118 Tauri



PGAO 2003-10-11 4h14m C: 5h30m +25°09' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
 5h29m16.50s +25°09'02.0" * HR 1821 HD 35943 Fl: 118 Ba: const: Tau mV: 5.47 b-v: 0.04 sp: B8.5V pm: 0.010 -0.032
 MAG: 5.8, 6.6 SEP: 4.8" PA: 204 deg

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	PI	Neb	N+C	Star	Unk				

This is a detailed astronomical chart of the constellation Orion. The constellation is outlined by a series of lines connecting its primary stars, which are represented by black dots of varying sizes. The three stars of Orion's Belt (Rigel, Saiph, and Bellatrix) are particularly prominent. A large circle is drawn around the central part of the constellation, highlighting the area around the star Betelgeuse. Several smaller circles and lines indicate specific celestial features, including the Orion Nebula and the Orion's Head. The background is filled with numerous smaller stars, and the entire chart is enclosed in a rectangular border. The text 'Delta Orionis' is visible in the bottom left corner, likely referring to the star Rigel.

5h32m00.40s -00°17'57.0" * HR 1852 HD 36486 Fl: 34 Ba:Del const:Ori mV: 2.23 b-v:-0.22 sp: O9.5III

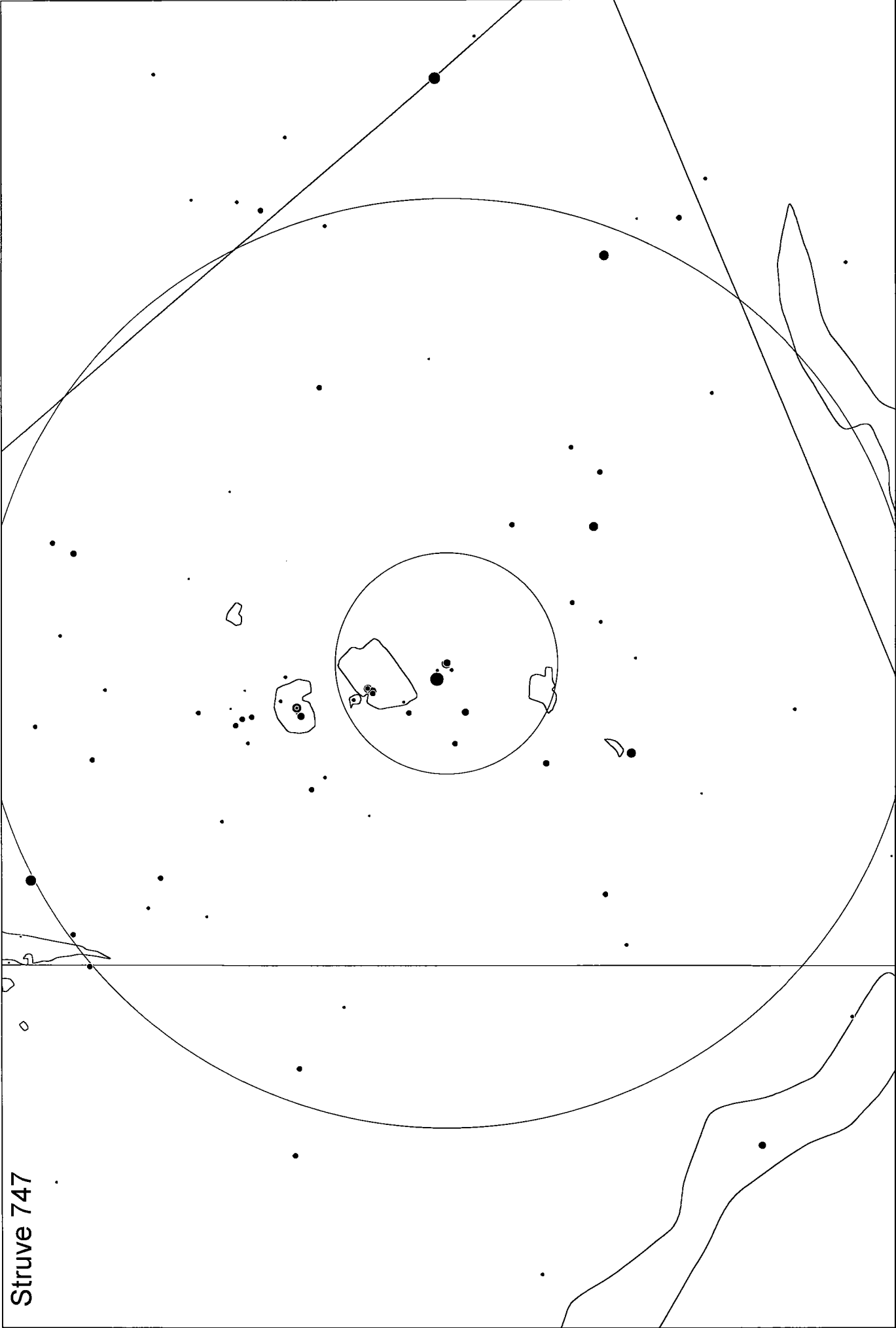
MAG: 2.2, 6.3 SEP: 52.6 PA: 359 deg

Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk
							+	x

This is a detailed astronomical chart of the constellation Struve 747. The chart features a dense field of stars of varying magnitudes, represented by dots of different sizes. Several prominent star patterns are highlighted with lines connecting them, forming a complex network. A large, irregularly shaped region is outlined in the center, containing a cluster of stars. Within this central region, there is a smaller, more defined circular area. The chart is labeled 'Struve 747' in the bottom left corner. The overall layout is a rectangular frame containing the star field and the highlighted patterns.

							Asteroid	(7)	Planet
Magnitude:	: 0	1	2	3	4	5	6		
Nebula:	Gx	Oc	Oc	Pt	Gc	Pt	Neb	+ x	Unk

Struve 747



PGAO 2003-10-11 4h14m C: 5h35m -06°00' L:+10°00' O:0° ARC HZ Cat: DSL TY2
5h35m01.01s -06°00'33.4" * TYC4778-01404-1 Bt: 5.28 Vt: 5.51 mV: 5.53 b-v: 0.20 pm: 0.002 0.001

Magnitude: 0 1 2 3 4 5 6 7 8										Variable	Double	Comet	Asteroid	Planet
●	●	●	●	●	●	●	●	●	●	⊙	●	☄	◆	♃
○	⊖	⊕	⊗	⊘	⊙	⊚	⊛	⊜	⊝	+	x			
Nebula: Gx Oc Gc Pl Neb N+C Star Unk														

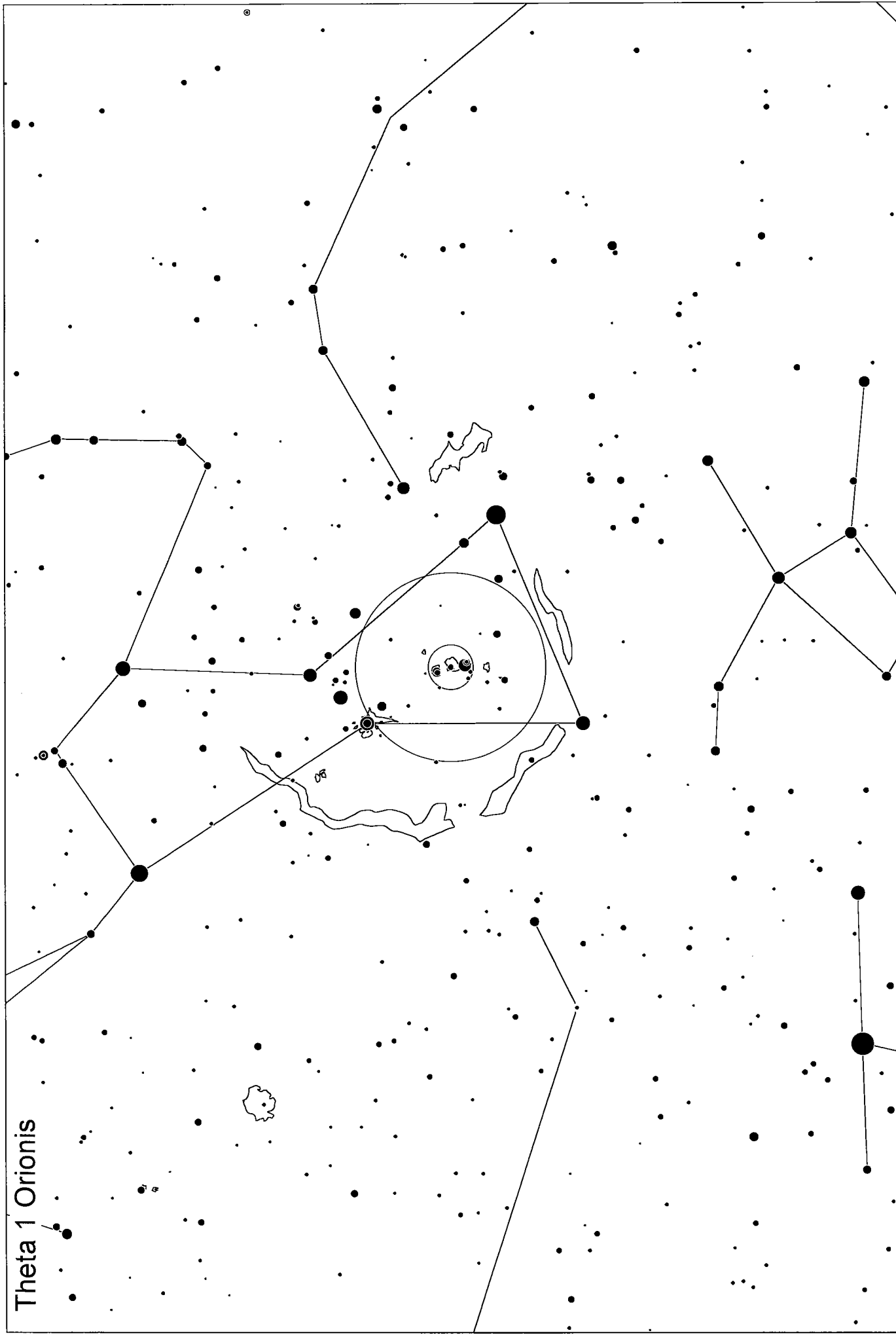
This is a detailed astronomical chart of the constellation Orion. The chart features a grid of right ascension (RA) and declination (Dec) lines. The constellation's primary stars are connected by lines to form its characteristic shape, including the belt and sword. The Orion Nebula (M42) is prominently displayed in the center, marked with concentric circles. The chart also shows numerous other stars of varying magnitudes, represented by dots of different sizes. The text 'Lamda Orionis' is visible in the bottom left corner, likely referring to the star Rigel (β Orionis).

PGAO 2003-10-11 4h14m C: 5h35m +09°56' L: +49°00' O:0° ARC HZ Cat: DSL BSC
5h35m08.30s +09°56'03.0" * HR 1879 HD 38861 Fl: 39 Ba: Lam const: Ori mV: 3.54 b-v: -0.18 sp: O8III((f))
MAG: 3.6, 5.5 SEP: 4.4" PA: 43 deg pm: 0.000 -0.006 ,Meissa, Heka

Magnitude: :	0	1	2	3	4	5	6		
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									

[illegible]

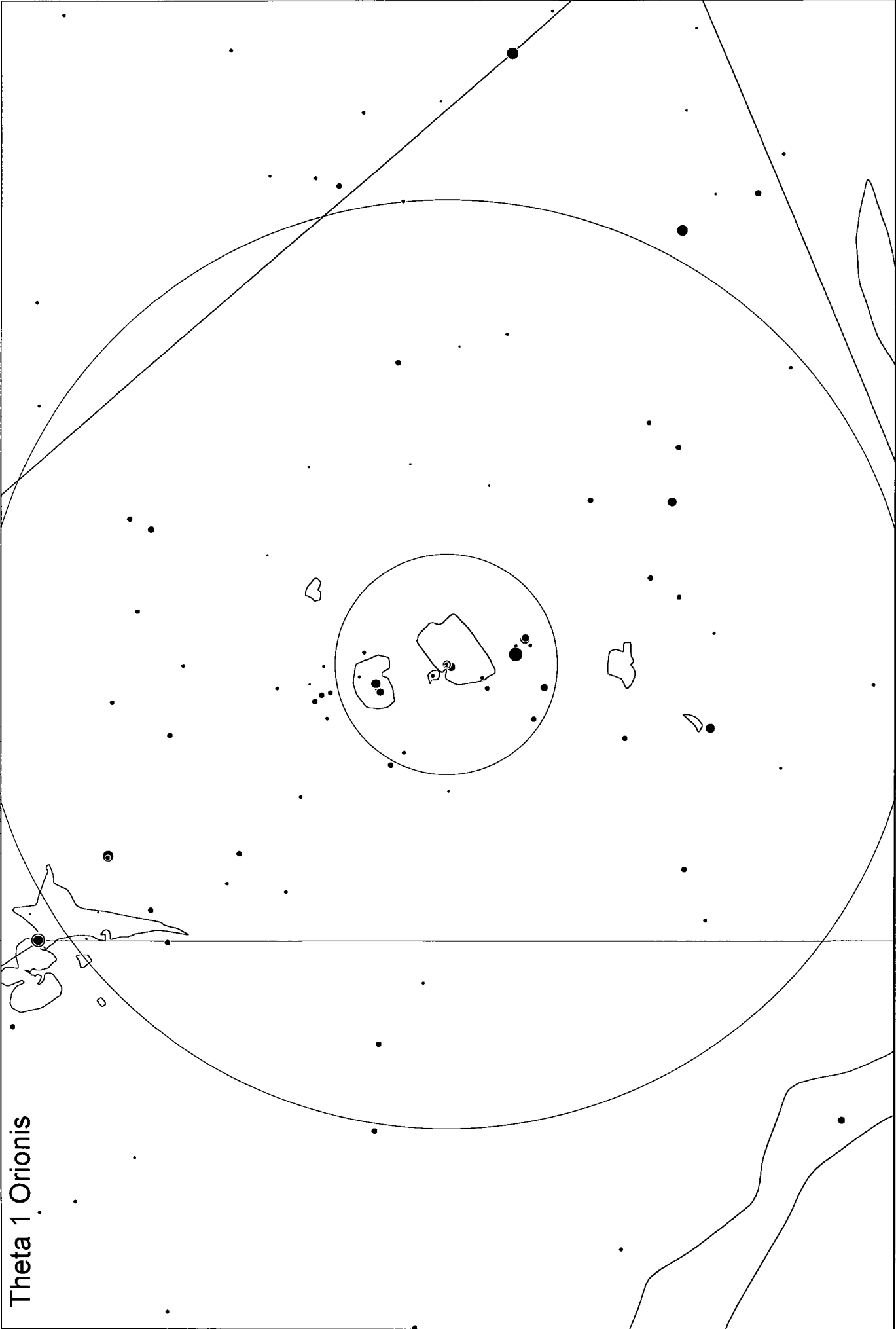
Theta 1 Orionis



PGAO 2003-10-11 4h14m C: 5h35m -05°23' L:+49°00' O:0° ARC HZ Cat: DSL BSC
 5h35m11.01s -05°55'36.9" * TYC4778-01370-1 Bt: 7.28 Vt: 7.42 mV: 7.43 b-v: 0.12 pm: -0.001 -0.001

Magnitude: 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

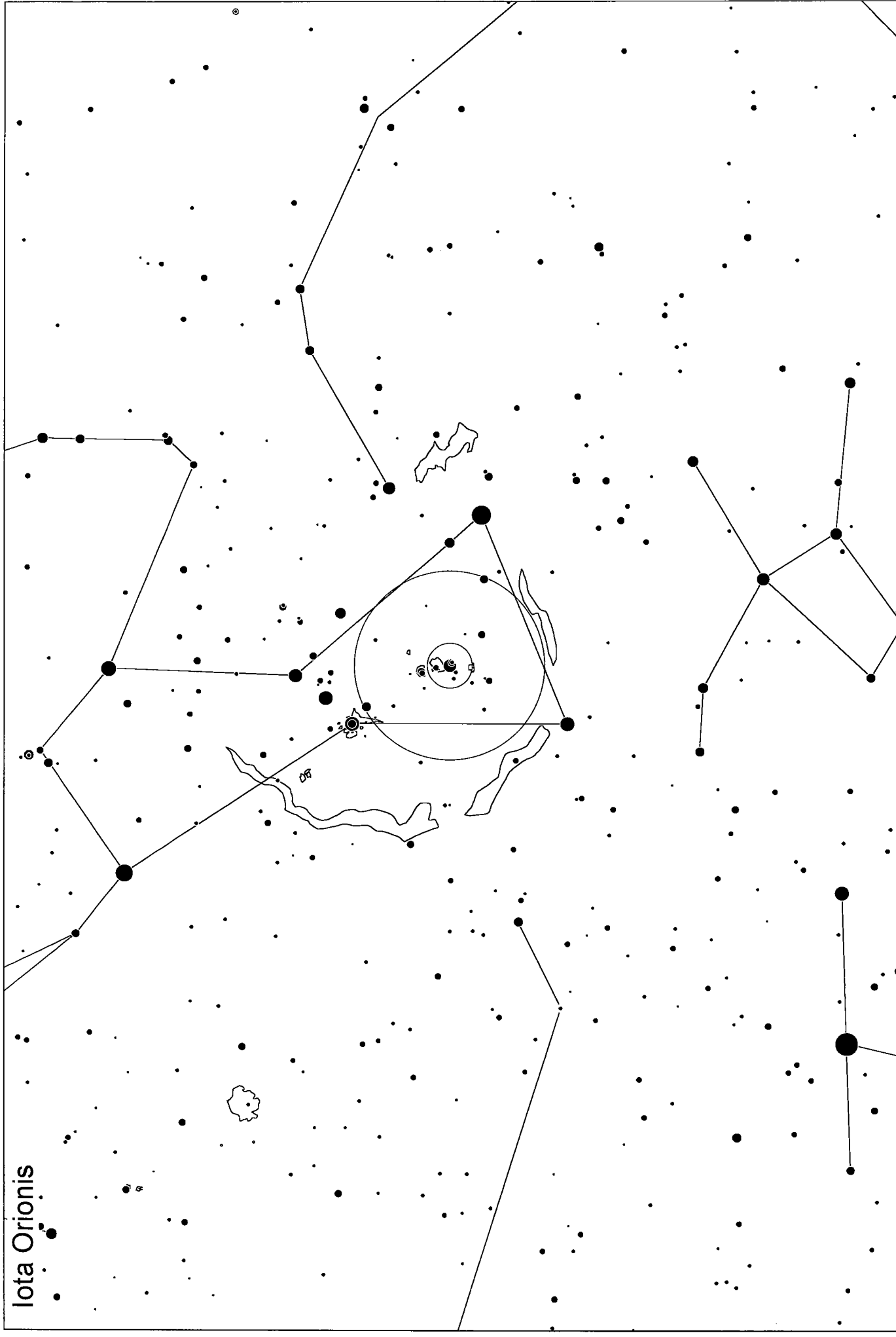
Theta 1 Orionis



PGAO 2003-10-11 4h14m C: 5h35m -05°23' L:+10°00' O:0° ARC HZ Cat: DSL BSC SKY TY2
5h35m11.01s -05°55'36.9" * TYC4778-01370-1 Bt: 7.28 Vt: 7.42 mV: 7.43 b-v:-0.12 pm:-0.001-0.001

Magnitude:	0	1	2	3	4	5	6	7	8	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	Pi	Neb	N+C	Star	Unk						

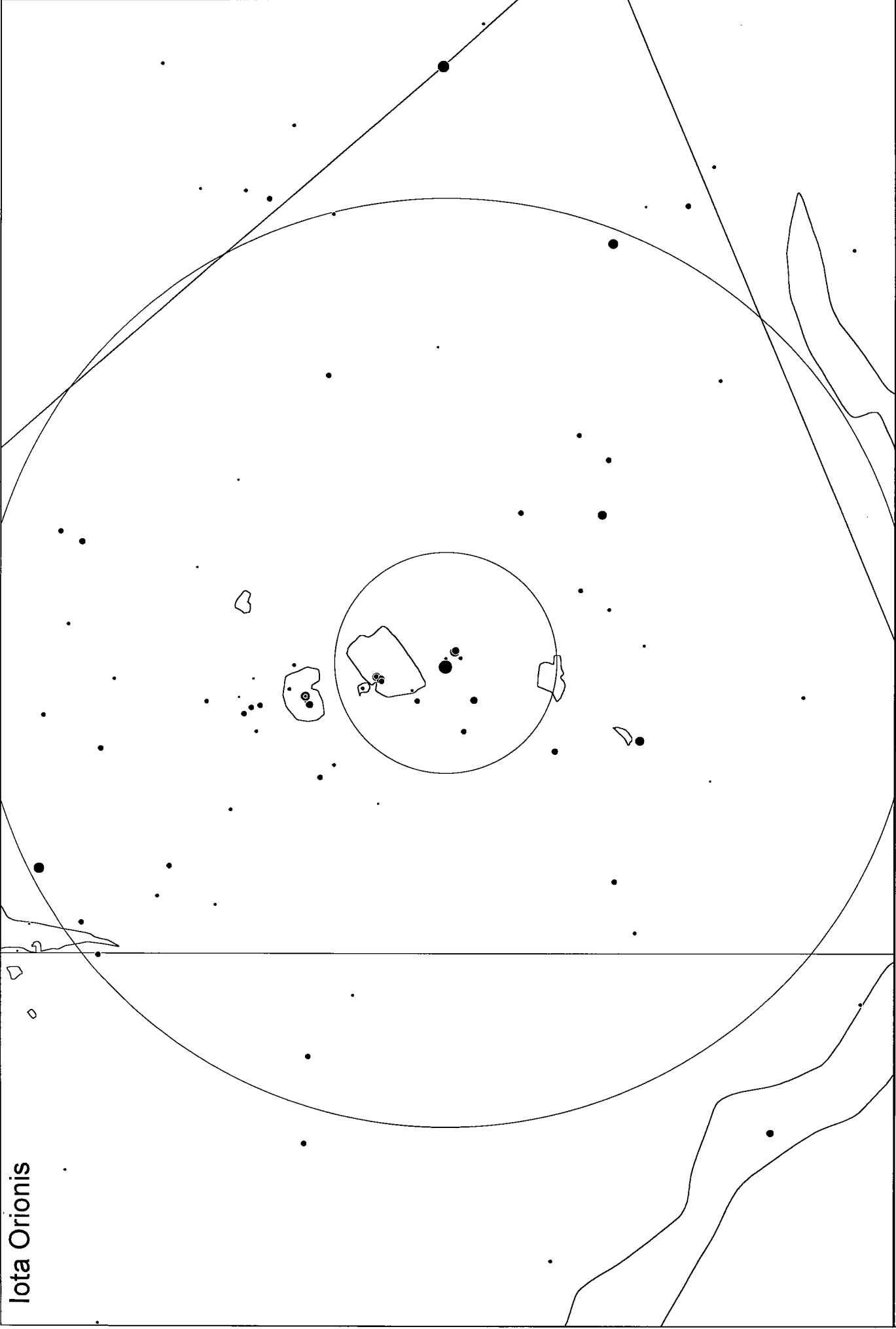
Iota Orionis



PGAO 2003-10-11 4h14m C: 5h36m -05°54' L: +49°00' O:0° ARC HZ Cat: DSL BSC
 5h35m26.45s -05°54'44.5" * mV: 7.73 B-V: sp: Dbl: 11.40"/ 4.10m pm:-0.016 -0.001

Magnitude: 0 1 2 3 4 5 6	Variable	Double	Comet	Asteroid	Planet
Gx Oc Gc Pl Neb N+C Star Unk	+	+	+	+	+

Iota Orionis

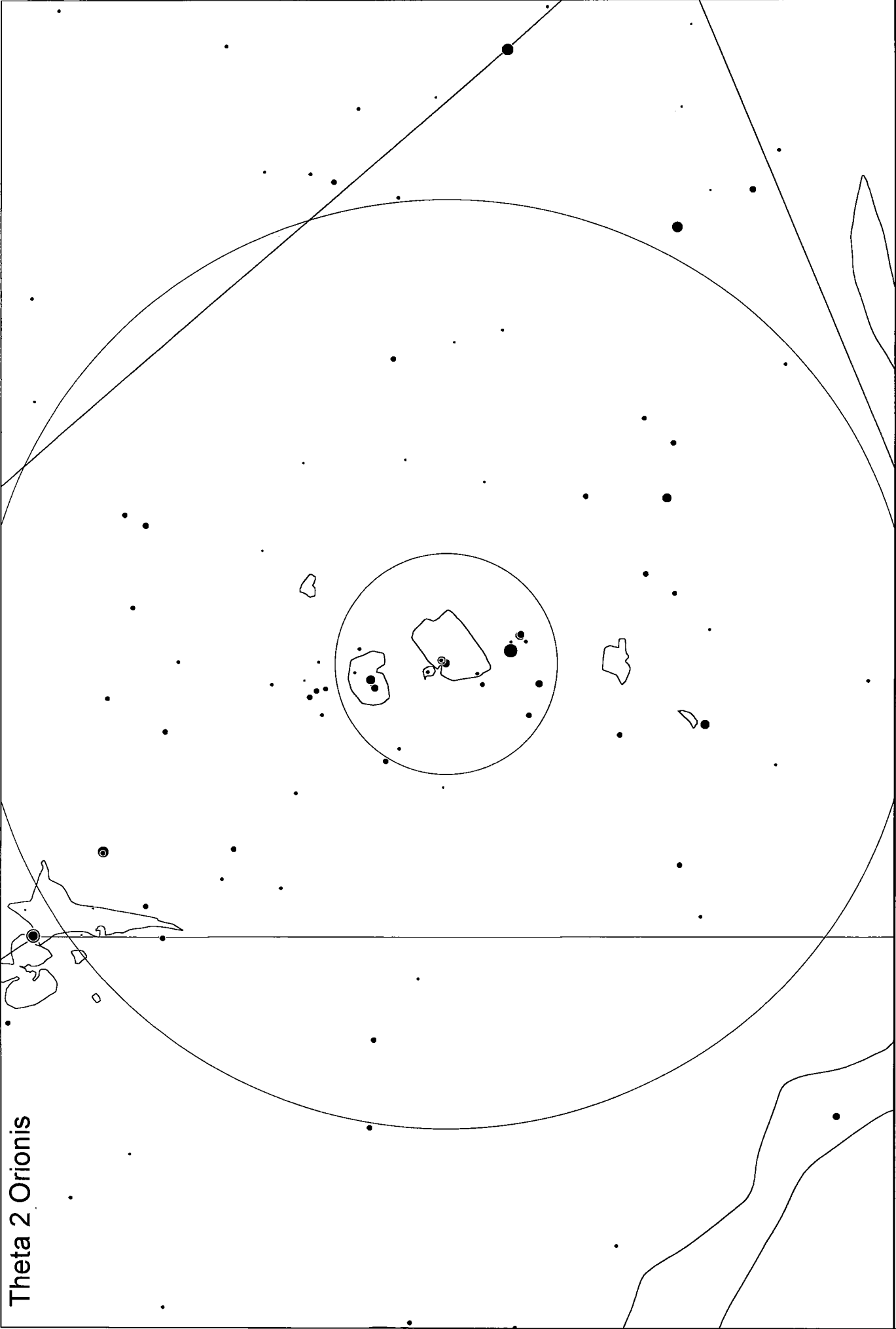


PGAO 2003-10-11 4h14m C: 5h35m -05°55' L:+10°00' O:0° ARC HZ Cat: DSL TY2
5h35m11.01s -05°55'36.9" * TYC4778-01370-1 Bt: 7.28 Vt: 7.42 mV: 7.43 b-v:-0.12 pm:-0.001 -0.001

Magnitude: 0 1 2 3 4 5 6 7 8										Variable	Double	Comet	Asteroid	Planet
Gx Oc Gc Pl Neb N+C Star Unk										+	x			

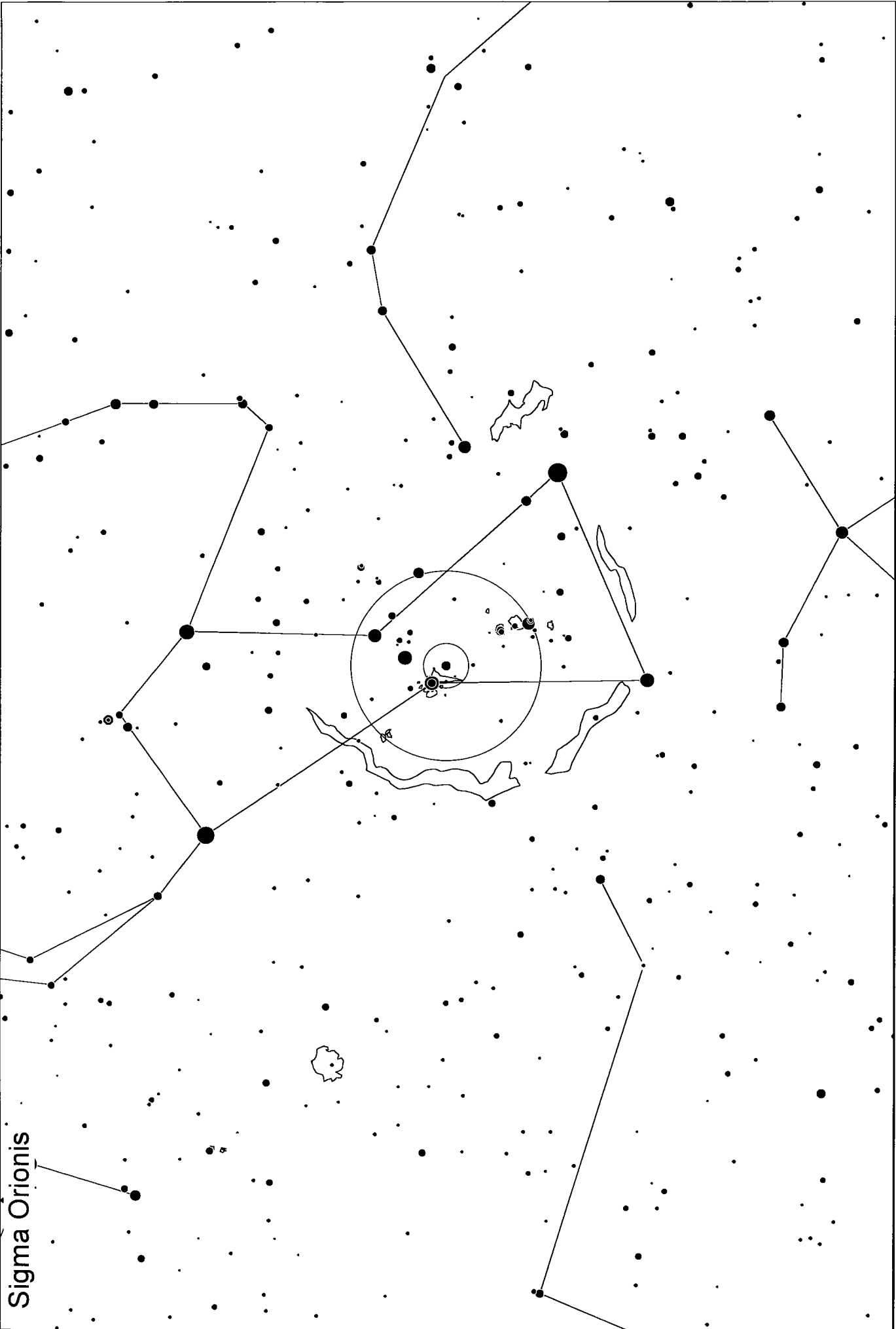
							Asteroid	Planet				
Magnitude:	: 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	Pi	Neb	N+C	Star	Unk				

Theta 2 Orionis



PGAO 2003-10-11 4h14m C: 5h36m -05°25' L:+10°00' O:0° ARC HZ Cat: DSL BSC SKY TY2
5h35m22.90s -05°24'57.8" * TYC4774-00933-1 Bt: 4.91 Vt: 5.03 mV: 5.04 b-v:-0.10 pm: 0.004 0.004

Magnitude: 0 1 2 3 4 5 6 7 8										Variable	Double	Comet	Asteroid	Planet
Gx Oc Gc Pl Neb N+C Star Unk										+	x			



Sigma Orionis

PGAO 2003-10-11 4h14m C: 5h39m -02°36' L: +49°00' O: 0° ARC HZ Cat: DSL BSC
 5h38m 44.80s -02°36'00.0" * HR 1931 HD 37468 Fl: 48 Ba: Sig const: Ori mV: 3.81 b-v: -0.24 sp: O9.5V
 MAG: 4.0, 7.5, 6.5 SEP: 12.9", 43" PA: 84, 61 deg pm: 0.002 0.001

Magnitude: 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Gx	Gc	Oc	+	×	+	×	+	×	+	×	×
Nebula:	Gx	Oc	Gc	PI	Neb	N+C	Star	Unk			

This is a detailed astronomical chart of the constellation Orion. The chart features the constellation's outline, with its primary stars connected by lines. A large circle is centered on the belt stars (Rigel, Saiph, and the belt stars). The chart includes numerous other stars of varying magnitudes, some labeled with Greek letters. The constellation is shown in a rectangular frame. The text "Zeta Orionis" is written vertically on the left side, pointing to a star.

PGAO 2003-10-11 4h14m C: 5h41m -01°56' L:+49°00' O:0° ARC HZ Cat: DSL BSC
5h40m 45.50s -01°56'34.0" * HR 1948 HD 37742 Fl: 50 BaZet const: Ori mV: 2.05 b-v: -0.21 sp: O9.7lb
MAG: 1.9, 4.0, 9.9 SEP: 2.4", 58" PA: 162, 10 deg pm: 0.003 -0.002 ;ALNITAK; Alnitah

Magnitude:	0	1	2	3	4	5	6		
								•	Planet
									Variable
									Double
									Comet
									Asteroid
									(7)

	$\odot$	$\ominus$	$\oplus$	$\bigcirc$	$\boxplus$	+	$\times$
Nebula:	Gx	Oc	Oc	Pl	Neb	N+C	Star Unk

[illegible]

This is a detailed black and white star chart of the constellation Theta Aurigae. The chart features numerous stars of varying magnitudes, represented by dots of different sizes. Several key stars are connected by lines to form the constellation's outline. A large circle highlights a central star, and a smaller circle is centered on it. Labels include 'Theta Aurigae' at the bottom left, 'M 35', 'M 36', 'M 37', and 'M 38' near the center, and 'M 39' at the top right. A small inset map in the top left corner shows the constellation's location within the larger sky.

PGAO 2003-10-5 5h07m C: 6h00m +37°13' L+49°00' O:0° ARC HZ Cat: DSL BSC SAC
5h59m 43.30s +37°12'45.0" * HR 2095 HD 40312 Fl: 37 Ba: The const:Aur mV: 2.62 b-v:-0.08 sp: A0pSi
MAG: 2.6, 7.1 SEP: 3.6" PA: 313 deg

[illegible]

								
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk

This is a detailed astronomical chart of the constellation Epsilon Monocerotis. The chart features a dense field of stars, with several stars connected by lines to form the constellation's outline. Two prominent star clusters are highlighted with large circles and labeled 'M 43' and 'M 50'. The constellation is labeled 'Epsilon Monocerotis' in the bottom left corner.

pm:-0.018 0.011

Magnitude: 0 1 2 3 4 5 6

Variable

Double

Comet

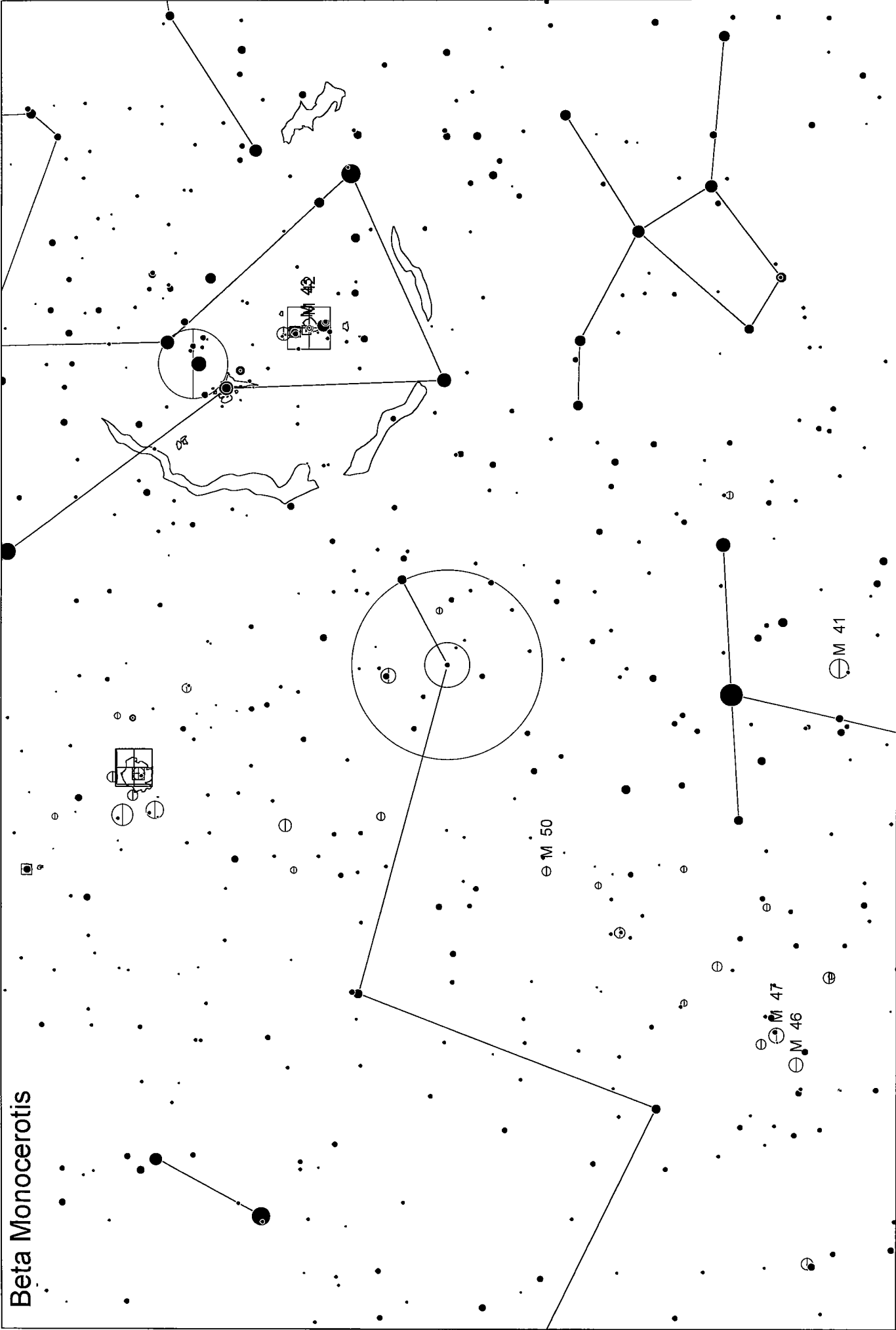
Asteroid

Planet

(7)

Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk
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Beta Monocerotis



PGAO 2003-10-5 5h07m C: 6h29m -07°02' L:+49°00' O:0° ARC HZ Cat: DSL BSC SAC
6h28m49.00s -07°01'58.0" * HR 2356 HD 45725 Fl: 11 Ba:Bet const:Mon mV: 4.60 b-v:-0.10 sp: B3Ve pm:-0.017 0.000
MAG: 4.7, 5.2 SEP: 7.3" PA: 132 deg

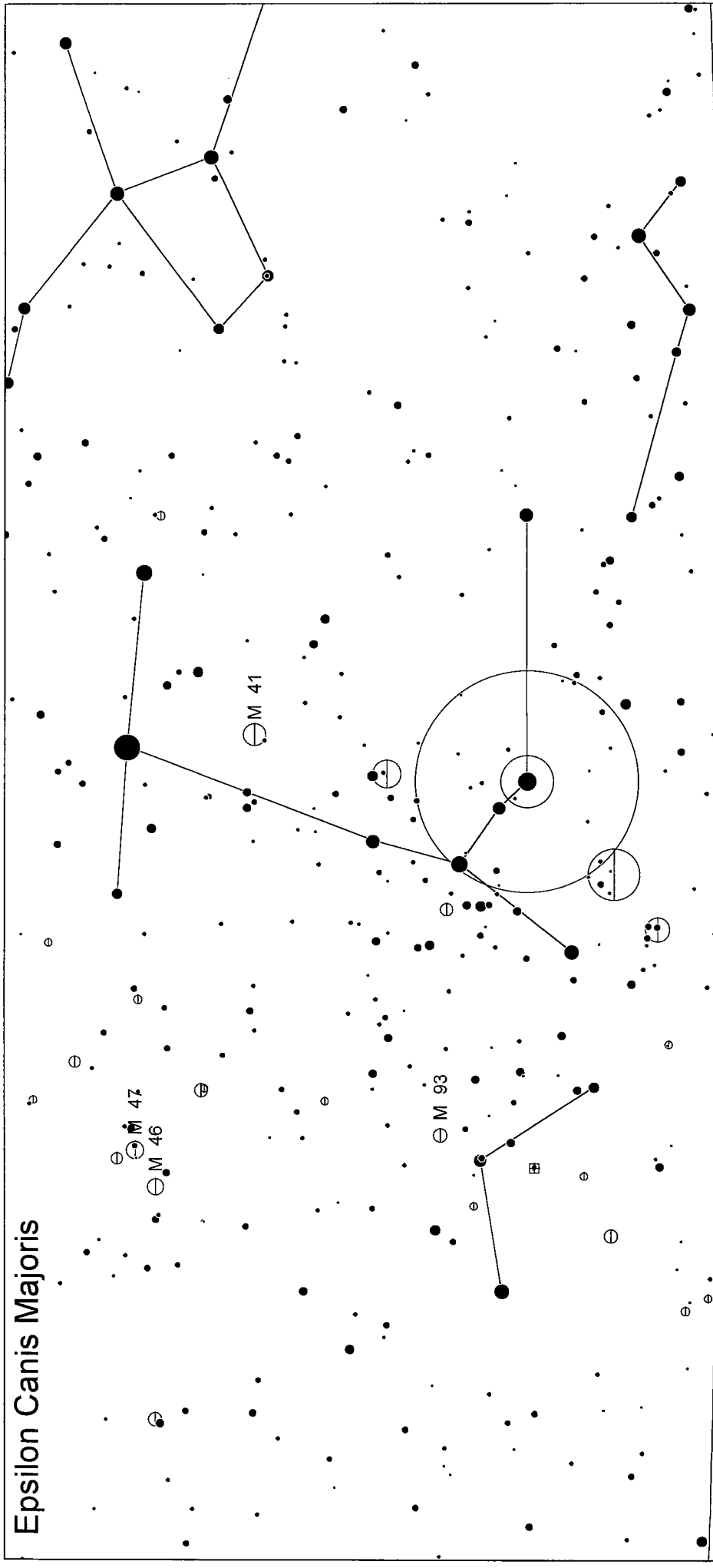
Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

12 Lyncis

6h46m14.10s +59°26'30.0" * HR 2470 HD 48230 P: 12 Ba: const:Lyn mV: 4.87 b-v: 0.08 sp: A3V
MAC: 5473 SED: 8.7" PA: 309 deg

$\times$	$\times$
$+$	$+$
$\boxplus$	$\boxplus$
$\boxtimes$	$\boxtimes$
$\oplus$	$\oplus$
$\ominus$	$\ominus$
0	0

Epsilon Canis Majoris



PGAO 2003-10-5 6h07m C: 6h59m -28°59' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
6h58m37.50s -28°58'20.0" * HR 2618 HD 52089 Fl: 21 Ba:Eps const:CMa mV: 1.50 b-v:-0.21 sp: B2II
MAG: 1.5, 7.4 SEP: 7.5° PA: 161 deg pm: 0.004 0.003 ;ADARA; ADHARA

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	Pj	Neb	N+C	Star	Unk				

A detailed astronomical chart of the constellation Delta Geminorum. The chart shows numerous stars of varying magnitudes, with several stars connected by lines to form the constellation's outline. A large circle is drawn around a central star, and a smaller circle is drawn around a star labeled 'M 35'. A star labeled 'M 44' is also circled. The text 'Delta Geminorum' is written vertically on the left side of the chart.

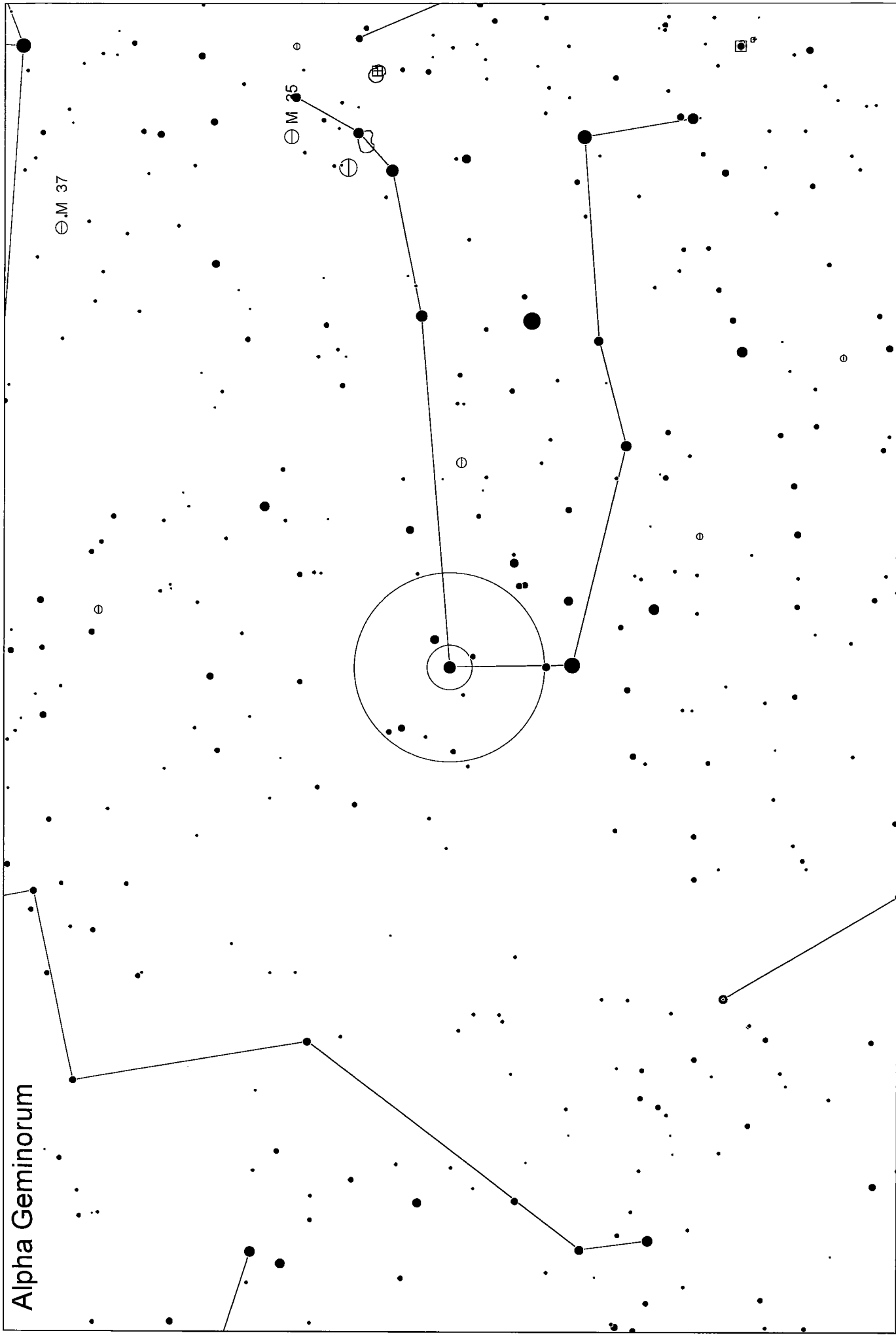
PGAO 2003-10-5 6h07m C: 7h20m +21°59' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
7h20m07.40s +21°58'56.0" * HR 2777 HD 56986 Fl: 55 Ba: Del const: Gem mV: 3.53 b-v: 0.34 sp: F2IV
MAG: 3.5, 8.2 SEP: 6.8" PA: 211 deg pm: -0.026 -0.012 ; Wasat; Wesat

Magnitude: 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
○	⊖	⊕	⊗	●	●	●	⊙	●	☄	◆	♁
Nebula: Gx	Gc	Oc	Pl	Gc	Pl	Neb	N+C	Star	Unk		

This is a detailed astronomical chart of the constellation Lynx. The chart features numerous stars of varying sizes, representing different magnitudes. Several stars are connected by lines to form the constellation's outline. Key features include:

- Star Labels:**
 - 19 Lynx:** Located in the lower-left corner, near a small circle with a horizontal line through it.
 - M 81:** Located in the lower-right corner, near a small circle with a horizontal line through it.
- Constellation Lines:** A network of lines connecting stars to define the shape of Lynx.
- Other Symbols:** A small circle with a horizontal line through it is also present in the lower-left area, and a small circle with a dot inside is located near the center-right.

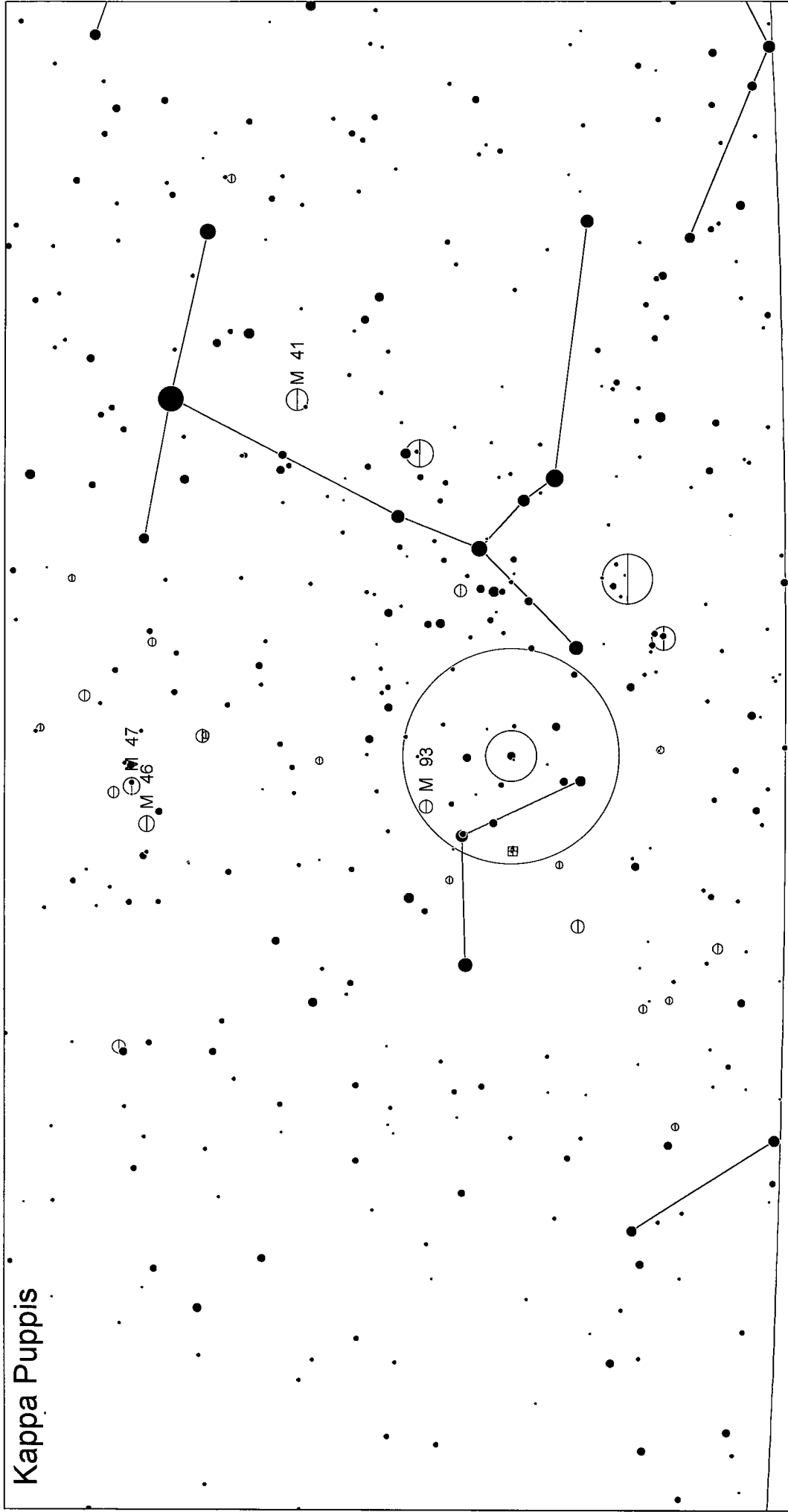
Alpha Geminorum



PGAO 2003-10-5 6h07m C: 7h35m +31°53' L:+49°00' O:0° ARC HZ Cat: DSL BSC SAC
 7h34m36.00s +31°53'18.0" * HR 2891 HD 60179 Fl: 66 Ba:Alp const:Gem m: 1.98 b-v: 0.03 sp: A1V
 MAG: 1.9, 2.9 SEP: 2.2" PA: 171 deg pm:-0.171 -0.098 ;CASTOR; Apollo

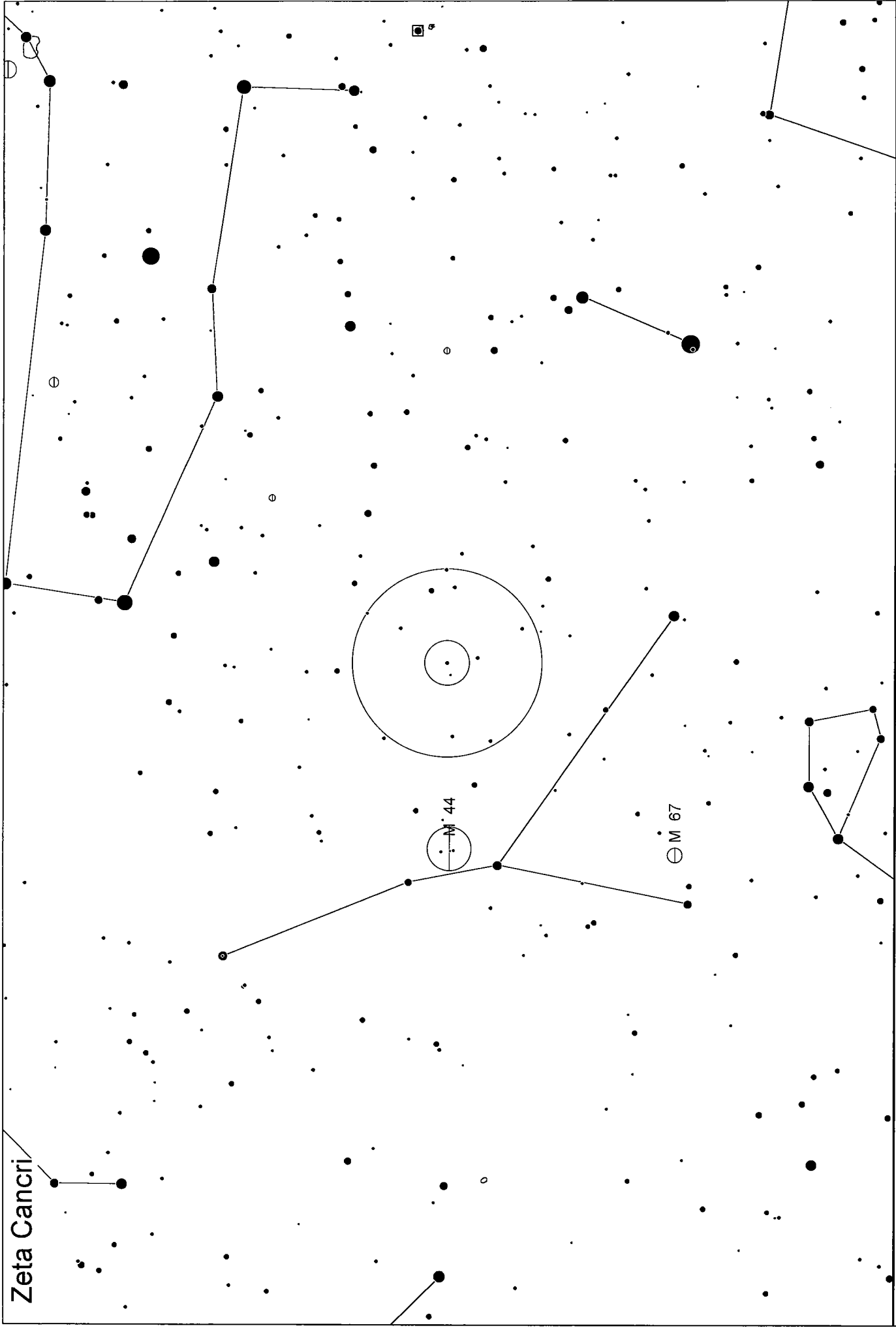
Magnitude: 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
○	●	●	●	●	●	●	⊙	●	☄	◆	♃
Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

Kappa Puppis



PGAO 2003-10-5 7h07m C: 7h39m -26°49' L:+49°00' O:0° ARC HZ Cat: DSL BSC SAC
 7h38m49.38s -26°48'06.5" * HD 61556 SAO174199 CD-26 4707 mV: 4.66 B-V:-0.11 sp:B3 Dbl: 9.90"/ 0.25m pm:-0.014 0.016
 MAG: 4.5, 4.7 SEP: 9.9" PA: 318 deg

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
	●	●	●	●	●	●	●	⊙	●	☄	◆	♃
Nebula:	○	⊖	⊕	○	□	⊞	+	x				
	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				



Zeta Cancri

PGAO 2003-10-5 7h07m C: 8h12m +17°38' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
 8h12m 12.70s +17°38'52.0" * HR 3208 HD 68257 Fl: 16 Ba: Zet1 const: Cnc mV: 5.63 b-v: 0.54 sp: F8V
 MAG: 5.6, 6.0 SEP: 5.9" PA: 89 deg pm: 0.066 -0.135 ; Tegmine

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
	●	●	●	●	●	●	●	○	●	☄	◆	♃
Nebula:	○	○	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

8h46m41.80s +28°45'36.0" * HR 3475 HD 74739 Fl: 48 Ba:lot const:Cnc mV: 4.02 b-v: 1.01 sp: G7.5IIaBa0.1 pm:-0.025 -0.042

•

— 2 —

This is a detailed black and white star chart of the constellation Lynx. The chart displays a dense field of stars, with the primary stars connected by lines to form the constellation's outline. Key features include:

- A large circle around the star M 44 (the Beehive Cluster) in the upper right.
- A smaller circle around the star M 67 in the lower right.
- A label "38 Lynx" in the bottom left corner.
- The chart is oriented with North at the top.

9h18m50.70s +36°48'09.0" * HR 3690 HD 80081 Fl: 38 Ba: const:Lyn mV: 3.82 b-v: 0.06 sp: A3V pm:-0.030 -0.122

Magnitude: 0 1 2 3 4 5 6

Variable Variable Double Comet Asteroid Planet

27

Nebula:	Gx	Oc	Gc	PI	Neb	N+C	Star	Unk
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A detailed black and white star chart of the constellation Alpha Leonis. The chart shows numerous stars of varying magnitudes, with the primary star, Alpha Leonis, highlighted by a large circle. Other stars are labeled with 'M' and numbers, such as 'M 44' and 'M 67'. The constellation's outline is defined by a series of connected lines. The text 'Alpha Leonis' is written vertically on the left side of the chart.

PGAO 2003-10-11 9h22m C: 10h09m +11°57' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
10h08m22.30s +11°58'02.0" * HR 3982 HD 87901 Fl: 32 Ba: Alp const: Leo mV: 1.35 b-v: 0.11 sp: B7V
MAG: 1.4, 7.7 SEP: 1.4, 7.7 PA: 307 deg pm: 0.248 0.006 ,REGULUS; Cor Leonis; Rex; Al Kalb al Asad; Kabeleced

Magnitude	0	1	2	3	4	5	6	
Planet								
Comet								
Asteroid								
Variable								
Double								

[illegible]

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	Pi	Neb	N+C	Star	Unk				

55 Leonis

Magnitude: : 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula: Gx	Oc	Oc	Pl	Gc	Pl	Neb	N+C	Star	Unk		

A black and white star chart of the constellation N Hydrae. The chart features a dense field of stars, represented by dots of varying sizes. Several stars are connected by thin lines to form the constellation's outline. A central star is highlighted with two concentric circles. The text "N Hydrae" is written vertically on the left side of the chart.

10h49m37.50s -16°11'37.0" * HR 4232 HD 93813 Fl: Ba:Nu const:Hya mV: 3.11 b-v: 1.25 sp: K2III pm: 0.094 0.200

MAG: 5.8, 5.9 SEP: 9.2" PA: 210 deg

Magnitude: : 0 1 2 3 4 5 6

Variable Variable Double Comet Asteroid Planet

7

Nebula: Gx Oc Gc Pl Neb N+C Star Unk

A detailed star chart of the constellation Delta Corvi. The chart shows numerous stars of varying magnitudes, with the primary stars connected by lines to form the constellation's outline. A large circle is drawn around the central star, and a smaller circle is drawn around the star immediately to its right. The text "Delta Corvi" is written vertically along the left edge of the chart.

PGAO 2003-10-11 9h22m C: 12h30m -16°32' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
12h29m51.90s -16°30'56.0" * HR 4757 HD108767 Fl: 7 Ba:Del const:Crv mV: 2.95 b-v:-0.05 sp: B9.5V
MAG: 3.0, 9.2 SEP: 24.2" PA: 214 deg

Magnitude:	0	1	2	3	4	5	6		Variable	Double	Comet	Asteroid	(7)	Planet
Nebula:	Gx	Oc	Oc	Gc	Pt	Neb	N+C	Star	Unk					

Comae Berenices

M 64

M 53

3

[illegible]

1000

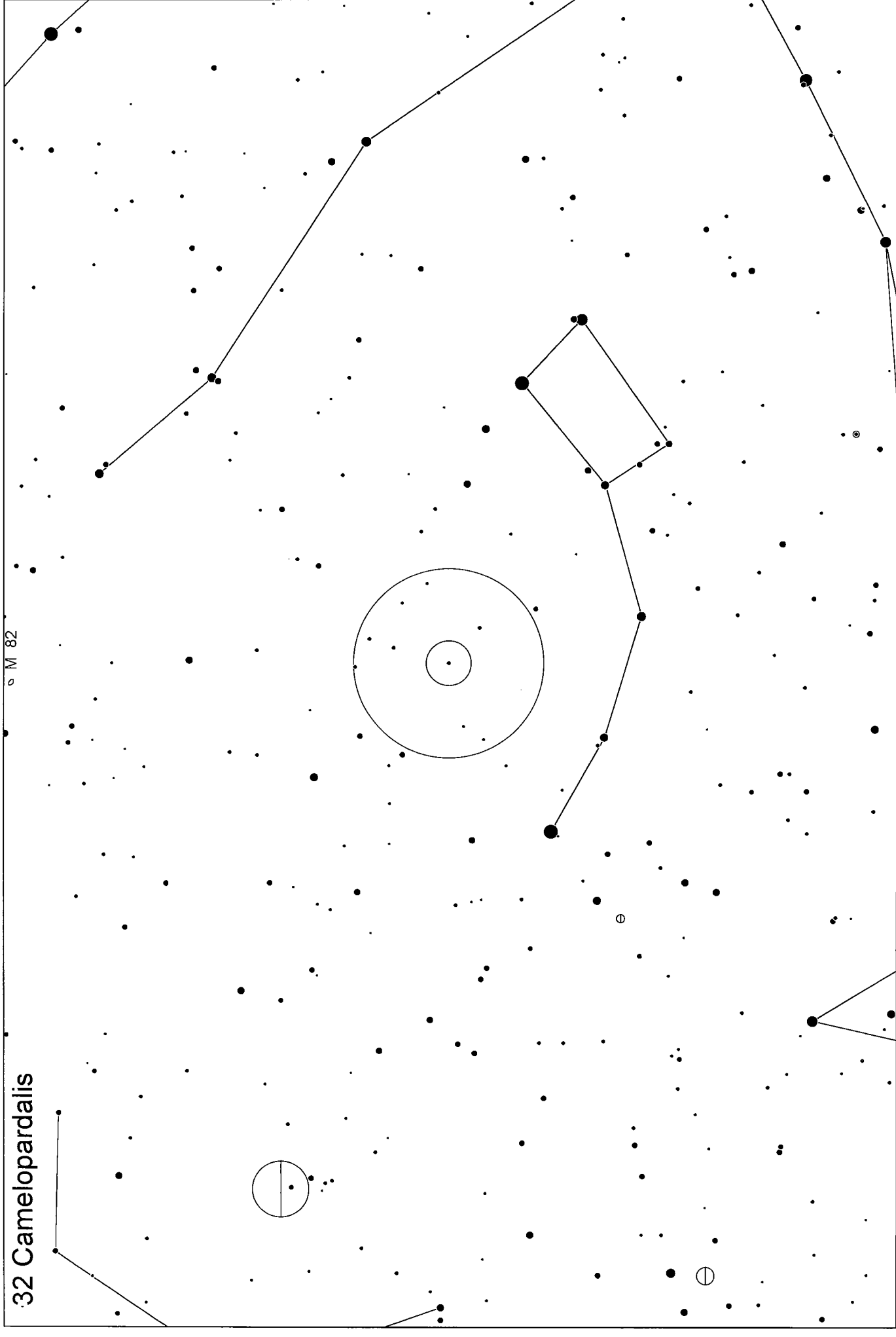
A detailed star chart of the constellation Gamma Virginis. The chart shows numerous stars of varying magnitudes, with the primary star, Gamma Virginis, highlighted by a large circle. Other stars are connected by lines to form the constellation's shape. A label 'Gamma Virginis' is positioned at the bottom left, with a line pointing to the primary star. A small circle is also visible near the center of the constellation.

A detailed star chart of the constellation Gamma Virginis. The chart shows numerous stars of varying magnitudes, with the primary star, Gamma Virginis, highlighted by a large circle. Other stars are connected by lines to form the constellation's shape. A label 'Gamma Virginis' is positioned at the bottom left, with a line pointing to the primary star. A small circle is also visible near the center of the constellation.

A detailed star chart of the constellation Gamma Virginis. The chart shows numerous stars of varying magnitudes, with the primary stars connected by lines to form the constellation's outline. A central star is highlighted with a large circle, and a smaller circle is centered on it. The constellation is labeled 'Gamma Virginis' in the bottom left corner, with a line pointing to the central star. The background is a light gray grid.

32 Camelopardalis

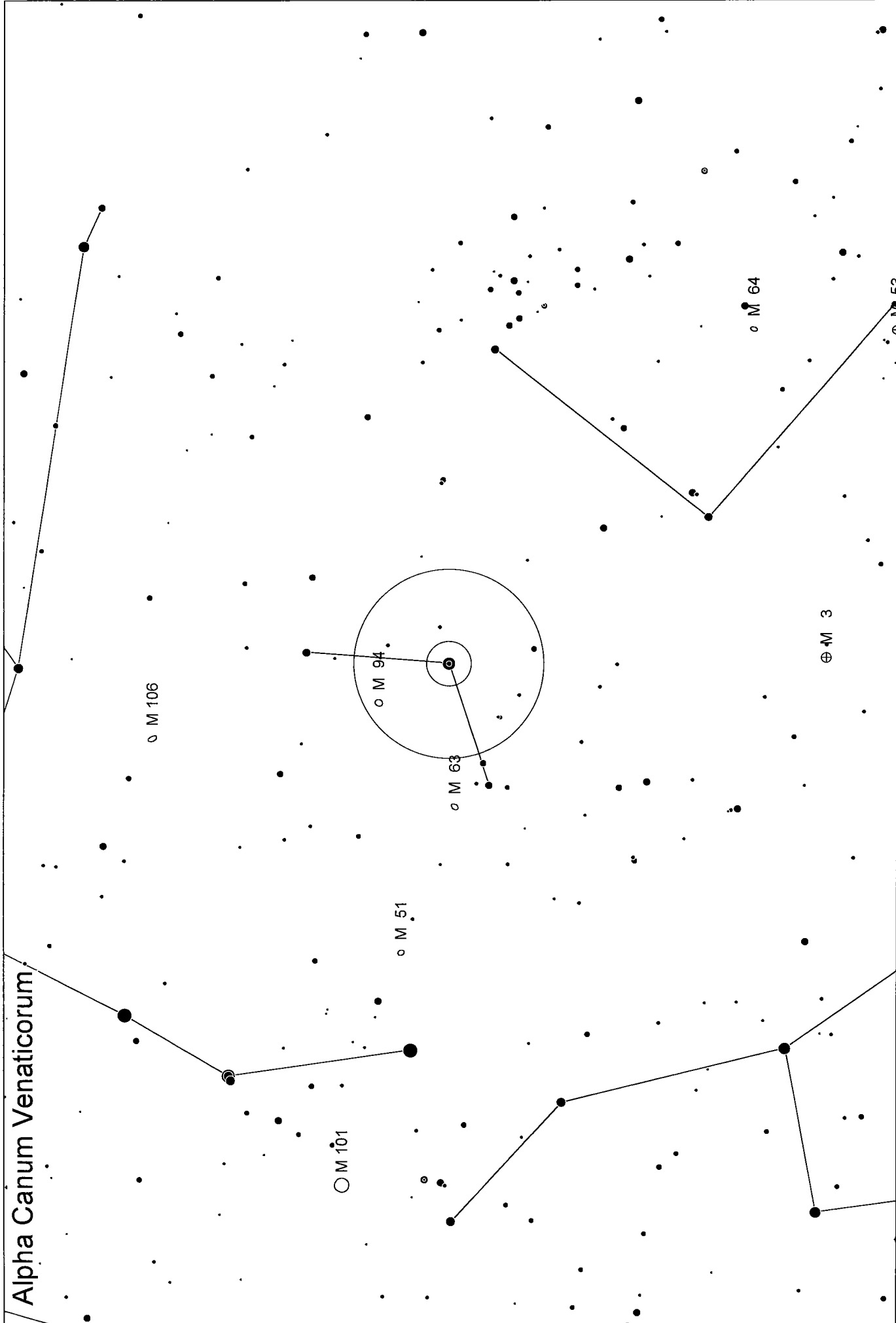
M 82



PGAO 2003-10-6 9h47m C: 12h49m +83°24' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
12h49m06.69s +83°25'04.2" * TYC4633-01784-1 Bt: 5.74 Vt: 5.74 mV: 5.74 b-v: 0.00 pm:-0.020 0.015
MAG: 5.3, 5.8 SEP: 21.6° PA: 326 deg

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
	●	●	●	●	●	●	●	○	●	☄	◆	♃
Nebula:	○	⊖	⊕	⊗	⊘	⊙	⊚	⊛	⊜	⊝	⊞	⊟
	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

Alpha Canum Venaticorum



PGAO 2003-10-7 8h54m C: 12h56m +38°18' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
12h56m01.70s +38°19'06.0" * HR 4915 HD112413 Fl: 12 Ba: Alp2 const: C/Vn mV: 2.90 b-v: -0.12 sp: AOpSiEuHg pm: -0.234 0.056 ; COR CAROLI
MAG: 2.9, 5.5 SEP: 19.4" PA: 229 deg

Magnitude: 0 1 2 3 4 5 6	Variable	Double	Comet	Asteroid	Planet
Gx Oc Gc Pl Neb N+C Star Unk					

This is a detailed star chart of the constellation Zeta Ursa Majoris. The chart displays a wide field of stars, with the primary stars connected by lines to form the constellation's outline. Key features include:

- Galaxies:** Several Messier objects are labeled, including M 94, M 63, M 51, and M 101. M 101 is a large spiral galaxy, and its central region is highlighted by a large circle.
- Stars:** Numerous stars of varying magnitudes are shown. The primary stars are connected by lines to form the constellation's outline.
- Labels:** The constellation is labeled "Zeta Ursa Majoris" in the top left corner. Other labels include "M 106", "M 94", "M 63", "M 51", and "M 101".
- Orientation:** The chart is oriented with North at the top.

13h23m55.50s +54°55'31.0" * HR 5054 HD116656 Fl: 79 Ba:Zet const:UMa mV: 2.27 b-v: 0.02 sp: A1VpSiSi
MAG: 2.3, 4.0, 4.0 SEP: 14.4", 709" PA: 152.71
pm: 0.122 -0.020 ;MIZAR; Mizat; Mirza

						x
Nebula:	Gx	Oc	Gc	PI	Neb	N+C Star Unk

This is a detailed star chart of the constellation Kappa Bootis. The chart displays a large number of stars, with the most prominent ones connected by lines to form the constellation's shape. The stars are represented by black dots of varying sizes, indicating their relative brightness. Several specific objects are labeled with text and symbols:

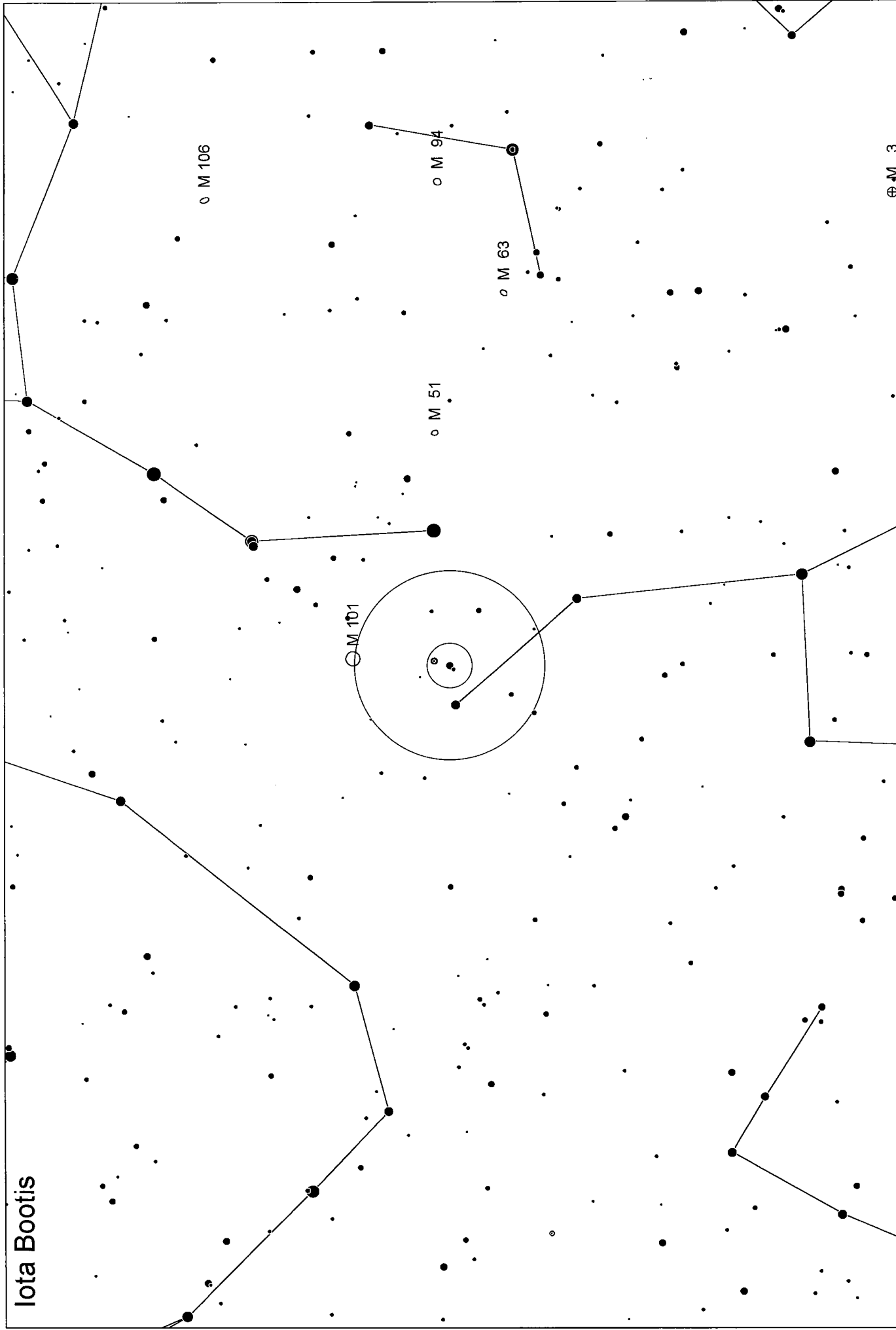
- M 101**: A large circle with a smaller circle inside, labeled "M 101".
- M 94**: A small circle with a dot inside, labeled "M 94".
- M 63**: A small circle with a dot inside, labeled "M 63".
- M 51**: A small circle with a dot inside, labeled "M 51".
- M 106**: A small circle with a dot inside, labeled "M 106".
- M 3**: A small circle with a dot inside, labeled "M 3".

The constellation is labeled "Kappa Bootis" in the bottom left corner. The chart is set against a white background with a black border.

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[illegible]

Iota Bootis



PGAO 2003-10-7 5h35m C: 14h16m +51°21' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC		pm: -0.150 0.092 Asellus Secundus	
14h16m 09.90s +51°22' 02.0" * HR 5350 HD125161 Fl: 21 Ba: ldt const: Boo mV: 4.75 b-v: 0.20 sp: A9V			
MAG: 4.9, 7.5 SEP: 38" PA: 33 deg			
Magnitude: 0 1 2 3 4 5 6		Variable Double Comet Asteroid Planet	
Nebula: Gx Oc Gc Pl Neb N+C Star Unk			

This is a black and white star chart of the constellation Pi Bootis. The chart features a dense field of stars, with the primary stars of the constellation connected by lines to form its characteristic shape. A large circle is drawn around a central star, and a smaller circle is drawn around a star to its right. Labels include 'Pi Bootis' at the bottom left, 'M 3' at the top left, 'M 53' at the top center, and 'M 5' at the bottom right.

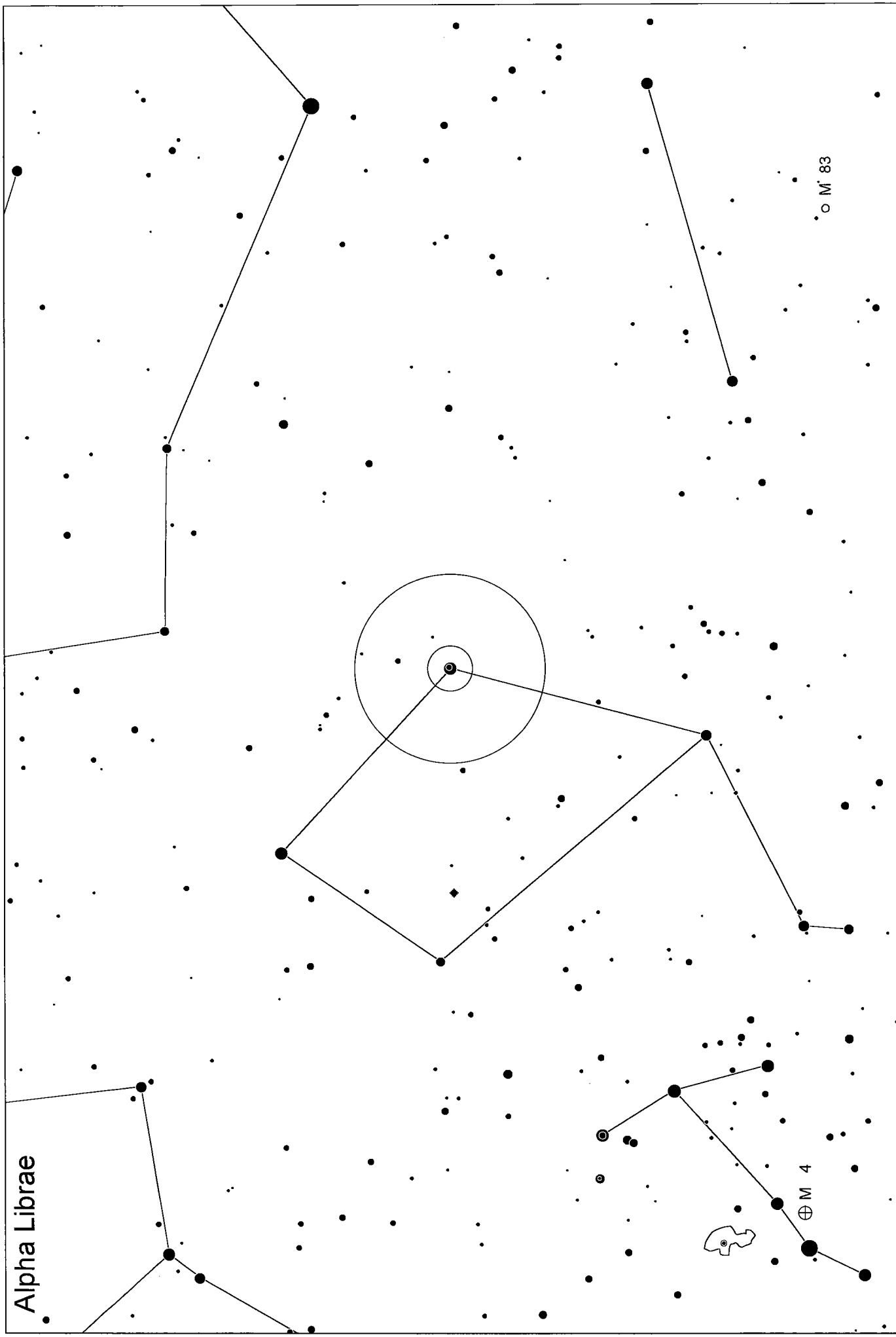
[illegible]

•

Age Group	No answer	No	Yes	Don't know
18-24	10.0	10.0	70.0	10.0
25-34	10.0	10.0	70.0	10.0
35-44	10.0	10.0	70.0	10.0
45-54	10.0	10.0	70.0	10.0
55-64	10.0	10.0	70.0	10.0
65-74	10.0	10.0	70.0	10.0
75-84	10.0	10.0	70.0	10.0
85+	10.0	10.0	70.0	10.0

																																																																																																																										
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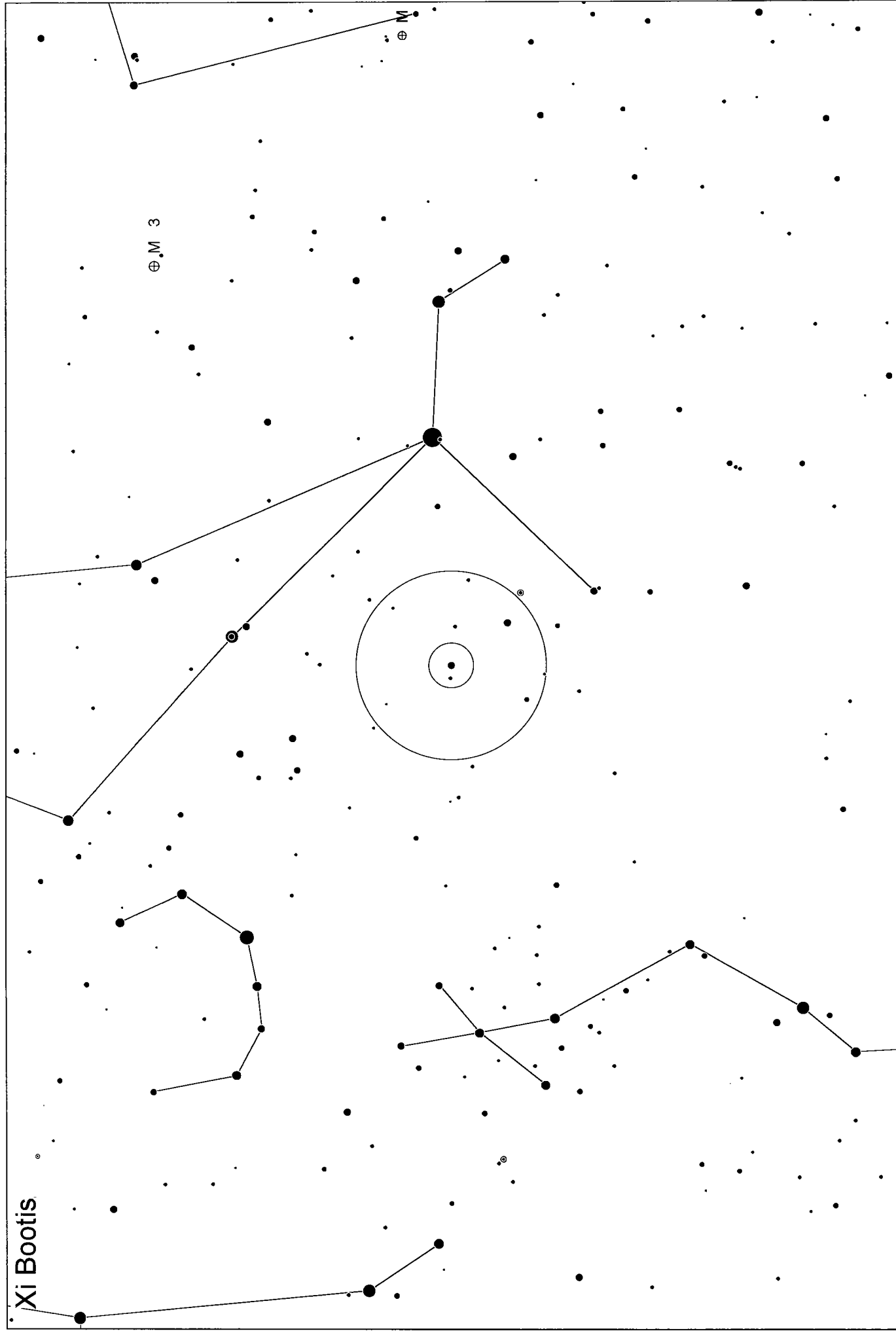
Alpha Librae



PGAO 2003-10-11 14h22m C: 14h51m -16°03' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
14h50m52.70s -16°02'30.0" * HR 5531 HD130841 Fl: 9 Ba: Alp2 const: Lib mV: 2.75 b-v: 0.15 sp: A3IV
MAG: 2.8, 5.2 SEP: 231" PA: 314 deg pm: -0.106 -0.067 ; Zuben Elgenubi; Zubenelgenubi; Kiffa Australis; Elkhiffa Australis

Magnitude: 0 1 2 3 4 5 6										Variable	Double	Comet	Asteroid	Planet
● ● ● ● ● ● ● ● ● ●										○	●	☄	◆	♃
○										⊕	⊙	☄	♃	♃
Gx										Oc	Gc	Pl	Neb	N+C Star
Nebula:										Gx	Oc	Gc	Pl	Neb
										+	+	+	+	+
										×	×	×	×	×
										Unk	Unk	Unk	Unk	Unk

Xi Bootis



PGAO 2003-10-7 14h48m C: 14h52m +19°05' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
 14h51m23.30s +19°06'04.0" * HR 5544 HD131156 FI: 37 Ba:Xi const:Boo mV: 4.55 B-v: 0.76 sp: G8Ve+K4Ve pm: 0.137 -0.098
 MAG: 4.7, 7.0 SEP: 6.9" PA: 332 deg

Magnitude: 0 1 2 3 4 5 6	Variable	Double	Comet	Asteroid	Planet
Gx Oc Gc Pl Neb N+C Star Unk	+	+	+	+	+

Delta Bootis

M 92

M 13

M 3

PGAO 2003-10-7 14h48m C: 15h16m +33°18' L:+49°00' O:0° ARC HZ Cat: DSL BSC SAC
15h15m30.20s +33°18'53.0" * HR 5681 HD135722 Fl: 49 Ba:Del const:Boo mV: 3.47 b-v: 0.95 sp: G8IIFe-1 pm: 0.086 -0.112
MAG: 3.5, 8.7 SEP: 105" PA: 79 deg

Magnitude: 0 1 2 3 4 5 6 Variable Double Comet Asteroid Planet

Nebula: Gx Oc Gc Pl Neb N+C Star Unk

This is a detailed star chart of the constellation Mu Bootis. The chart features a light gray background with a grid of lines. Numerous stars are plotted as black dots of varying sizes, representing their relative brightness. The primary stars of the constellation are connected by thin black lines to form its characteristic shape. A large circle is drawn around the central star, and a smaller circle is drawn around a star to its right. The chart is labeled with 'Mu Bootis' in the top left corner, 'M 92' in the bottom left corner, and 'M 13' in the bottom right corner. The overall layout is clean and professional, typical of a scientific or educational publication.

15h24m29.40s +37°22'38.0" * HR 5733 HD137391 Fl: 51 Ba:Mu 1 const:Boo mV: 4.31 b-v: 0.31 sp: F2IVa
MAG: 4.3, 7.0 SEP: 108° PA: 171 deg pm:-0.146 0.087 ;Alkalurops; Inkalunis; Icalurus; Clava; Venabulum

	Gx	Oc	Gc	Pt	Neb	+ Neb	x
Nebula:							
	Gx	Oc	Gc	Pt	Neb	N+C Star	Unk

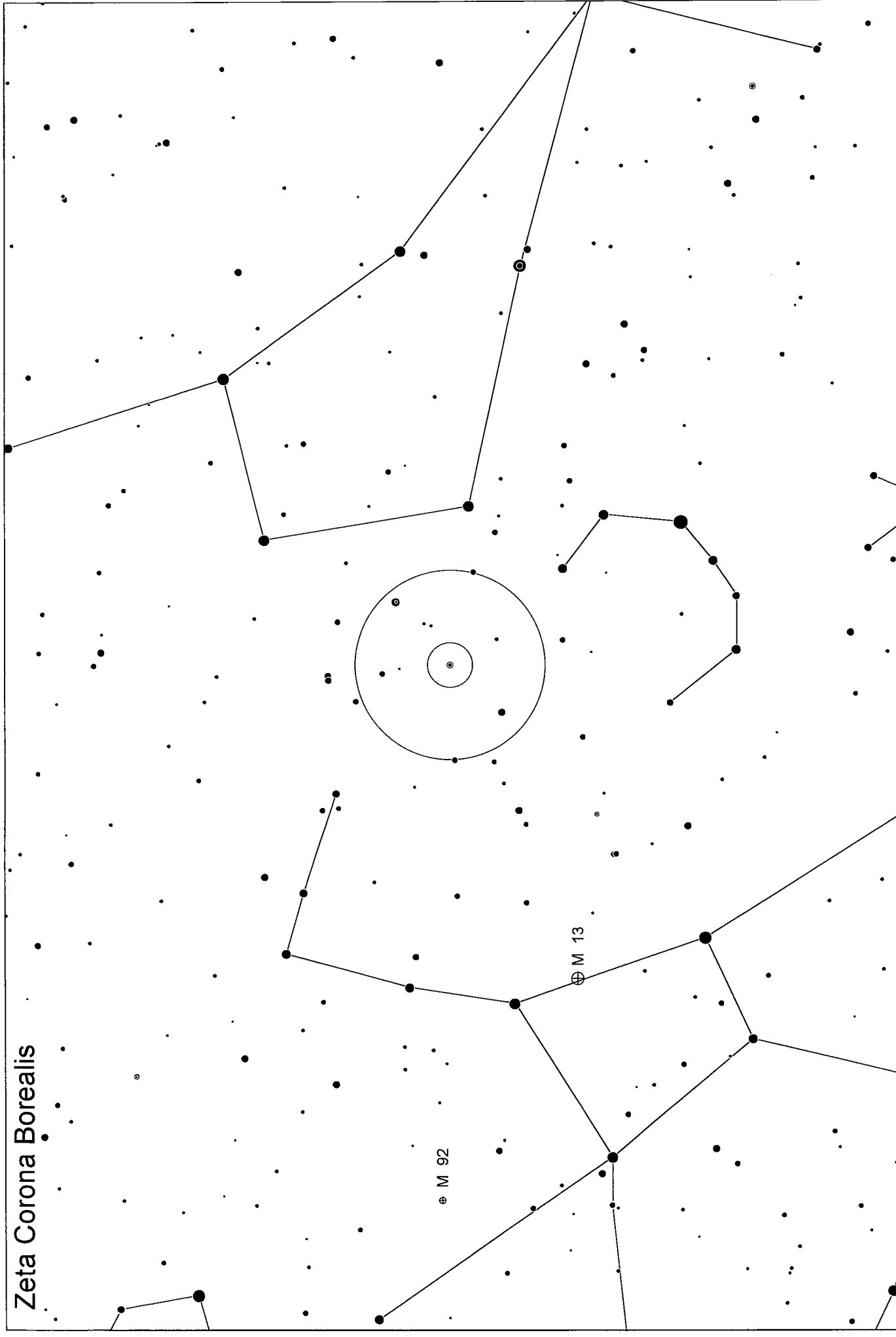
A detailed black and white star chart of the constellation Delta Serpentis. The chart shows numerous stars of varying magnitudes, with several stars connected by lines to form the constellation's outline. A large circle is drawn around a central star, and a smaller circle is drawn around a star to its right. The text "Delta Serpentis" is written vertically on the left side. The text "M 5" and "M 12" are written near the top right and bottom right respectively.

15h34m48.10s +10°32'21.0" * HR 5789 HD138918 Fl: 13 Ba:Del const:Ser mV: 3.80 b-v: 0.26 sp: F0IV

④

X

Zeta Corona Borealis



PGAO 2003-10-7 14h48m C: 15h40m +36°37' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
15h39m22.70s +36°38'09.0" * HR 5834 HD139892 Fl: 7 Ba.Zet2 const: CrB mV: 5.07 b-v: 0.12 sp: B7V
MAG: 5.1, 6.0 SEP: 6.3" PA: 305 deg

pmi: -0.013 -0.006

Magnitude: : 0 1 2 3 4 5 6 Variable Double Comet Asteroid Planet

Nebula: Gx Oc Gc Pl Neb N+C Star Unk

This is a detailed astronomical chart of the constellation Xi Scorpis. The chart displays a field of stars, with several stars connected by lines to form the constellation's outline. Key features include:

- Xi Scorpis:** The constellation's name is written in the top left corner.
- M 5:** A label for a specific star or object, located in the upper right quadrant.
- M 12:** A label for a specific star or object, located in the lower left quadrant.
- M 10:** A label for a specific star or object, located in the lower left quadrant.
- M 4:** A label for a specific star or object, located in the lower right quadrant.
- M 62:** A label for a specific star or object, located in the lower right quadrant.
- Nebula:** A large, faint, irregularly shaped nebula is depicted in the upper right quadrant.
- Central Object:** A large, faint, circular object is located in the center of the chart.
- Other Objects:** A small, bright, circular object is located in the lower left quadrant, and a small, bright, irregularly shaped object is located in the lower right quadrant.

PGA0 2003-10-8 19h02m C: 16h05m -11°23' L:49°00' O:0° ARC HZ Cat: DSL BSC SAC
16h04m22.10s -11°22'23.0" * HR 5978 HD144070 Fl: Ba:Xi const:Sco mV: 4.77 b-v: 0.47 sp: F5IV
MAG: 4.8, 7.3 SEP: 7.6" PA: 51 deg

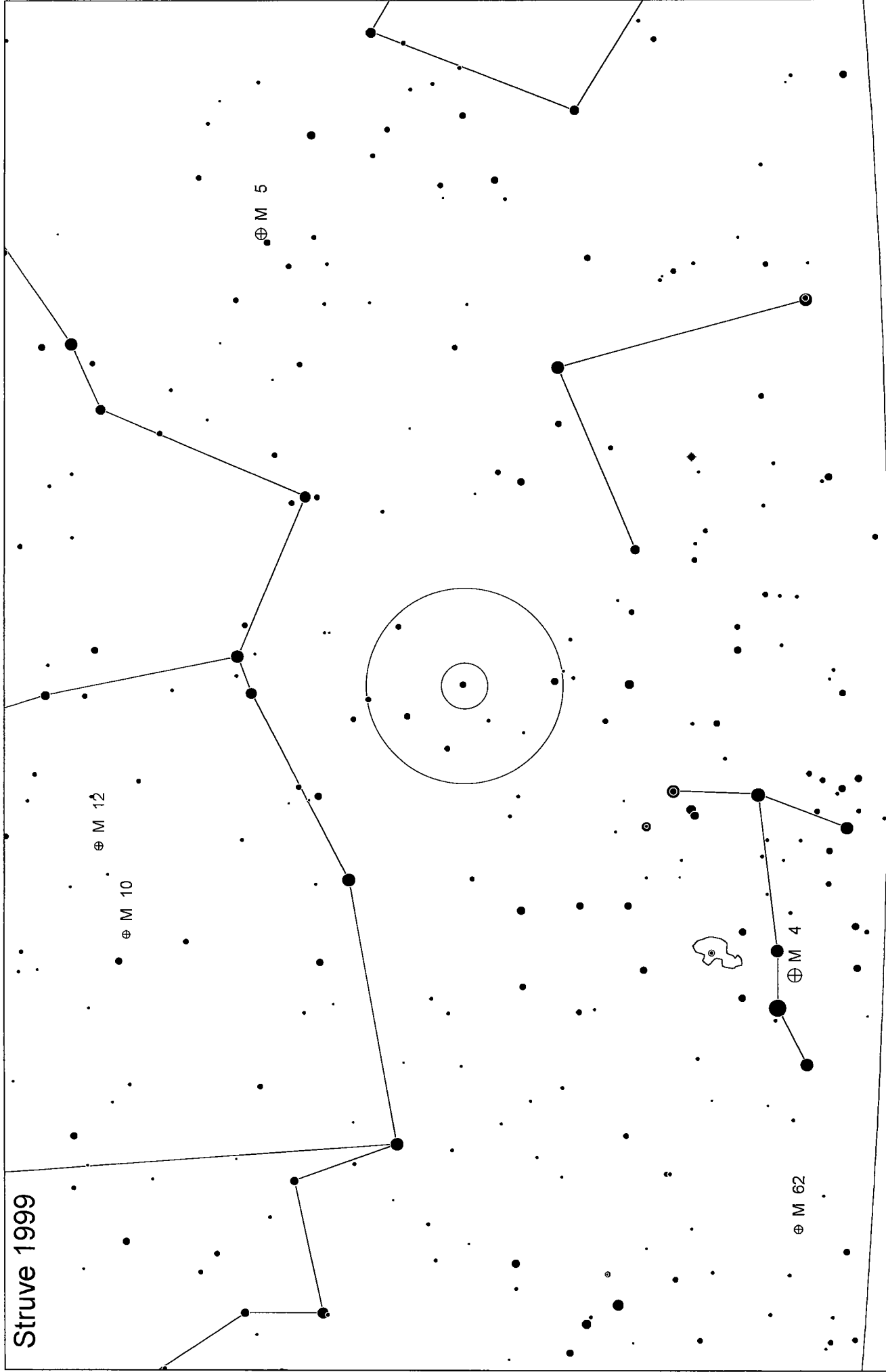
Magnitude: 0 1 2 3 4 5 6

Variable Double Comet Asteroid Planet

7

Nebula:	Gx	Oc	Gc	Pl	Neb
					N+C
					Star
					Unk

Struve 1999



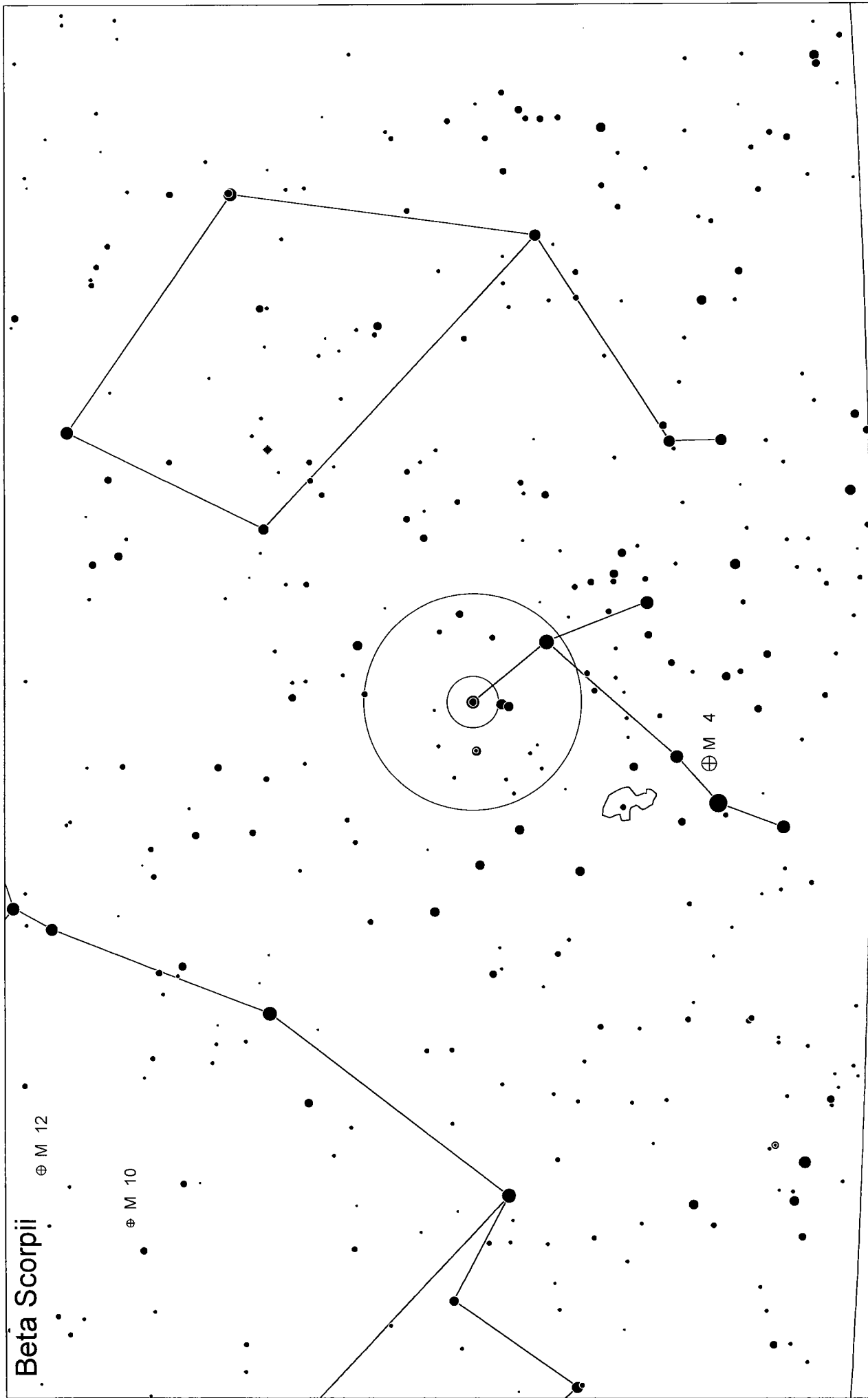
PGAO 2003-10-8 19h02m C: 16h05m -11°28' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
 16h04m25.92s -11°26'57.8" * HD144087 SAO159668 SD-11 4057 mV: 7.43 B-V: 0.74 sp:K0 Dbl: 11.70' 0.57m pm:-0.069 -0.021
 MAG: 7.4, 8.1 SEP: 11.6" PA: 99 deg

Magnitude: 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

Beta Scorpii

⊕ M 12

⊕ M 10



PGAO 2003-10-11 14h06m C: 16h06m -19°49' L: +45°00' O: 0° ARC HZ Cat: DSL BSC SKY SAC

16h05m26.20s -19°48'20.0" * HR 5984 HD144217 Fl: 8 Ba: Bet1 const: Sco mV: 2.62 b-v: -0.07 sp: B1V

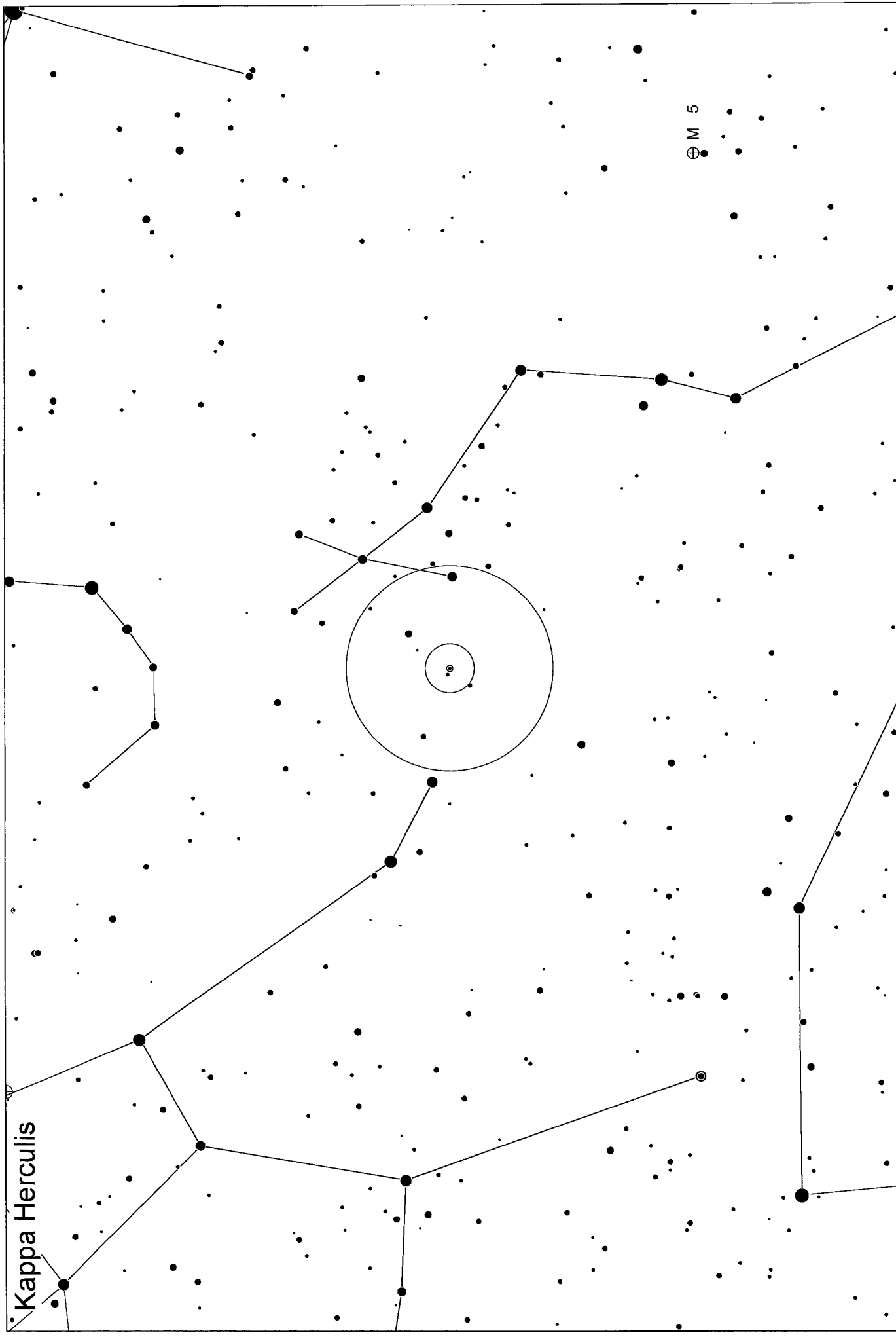
pm: -0.006 -0.019 ; Graffias; Grafias; Acrab; Akrab; Elacrab

MAG: 2.6, 4.9 SEP: 13.6" PA: 21 deg

Magnitude: 0 1 2 3 4 5 6 7 Variable Double Comet Asteroid Planet

Nebula: Gx Oc Gc Pl Neb N+C Star Unk

Kappa Herculis



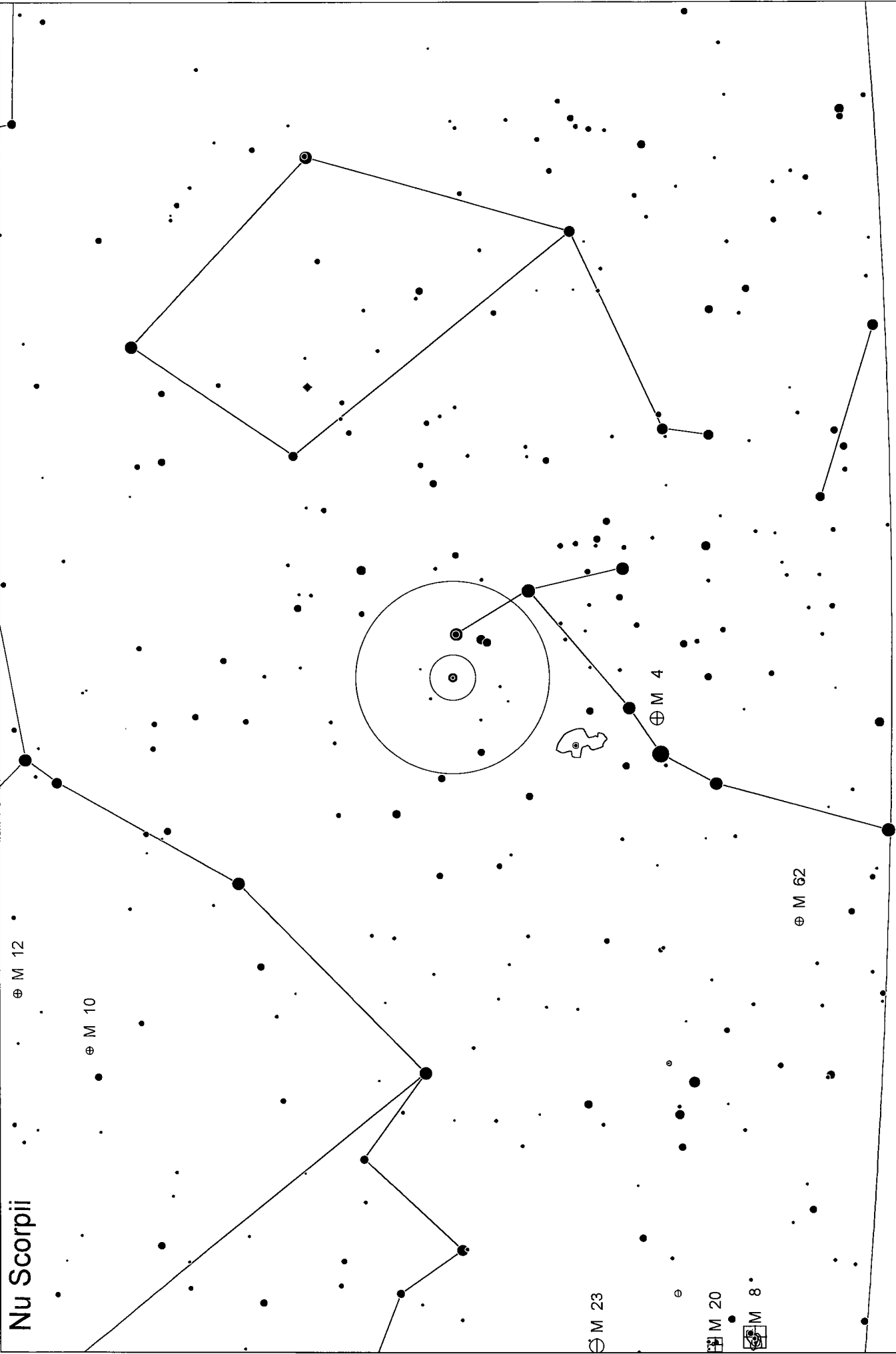
M 5

PGAO 2003-10-11 14h06m C: 16h08m +17°02' L:+45°00' O:0° ARC HZ Cat: DSL BSC SKY SAC
16h08m04.50s +17°02'49.0" * HR 6008 HD145001 Fl: 7 Ba:Kap const:Her mV: 5.00 b-v: 0.95 sp: G8III
MAG: 5.3, 6.5 SEP: 28" PA: 12 deg

pm:-0.032 -0.007 ;Marfik; Marsik; Mirfak; Marfak

Magnitude:	0	1	2	3	4	5	6	7	Variable	Double	Comet	Asteroid	Planet
	●	●	●	●	●	●	●	●	○	●	☄	◆	♃♄♅♆♇♈♉♊♋♌♍♎♏♐♑♒♓♔♕♖♗♘♙♚♛♜♝♞♟♠♡♢♣♤♥♦♧♨♩♪♫♬♭♮♯♰♱♲♳♴♵♶♷♸♹♺♻♼♽♾♿♰♱♲♳♴♵♶♷♸♹♺♻♼♽♾♿
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk					

Nu Scorpjii



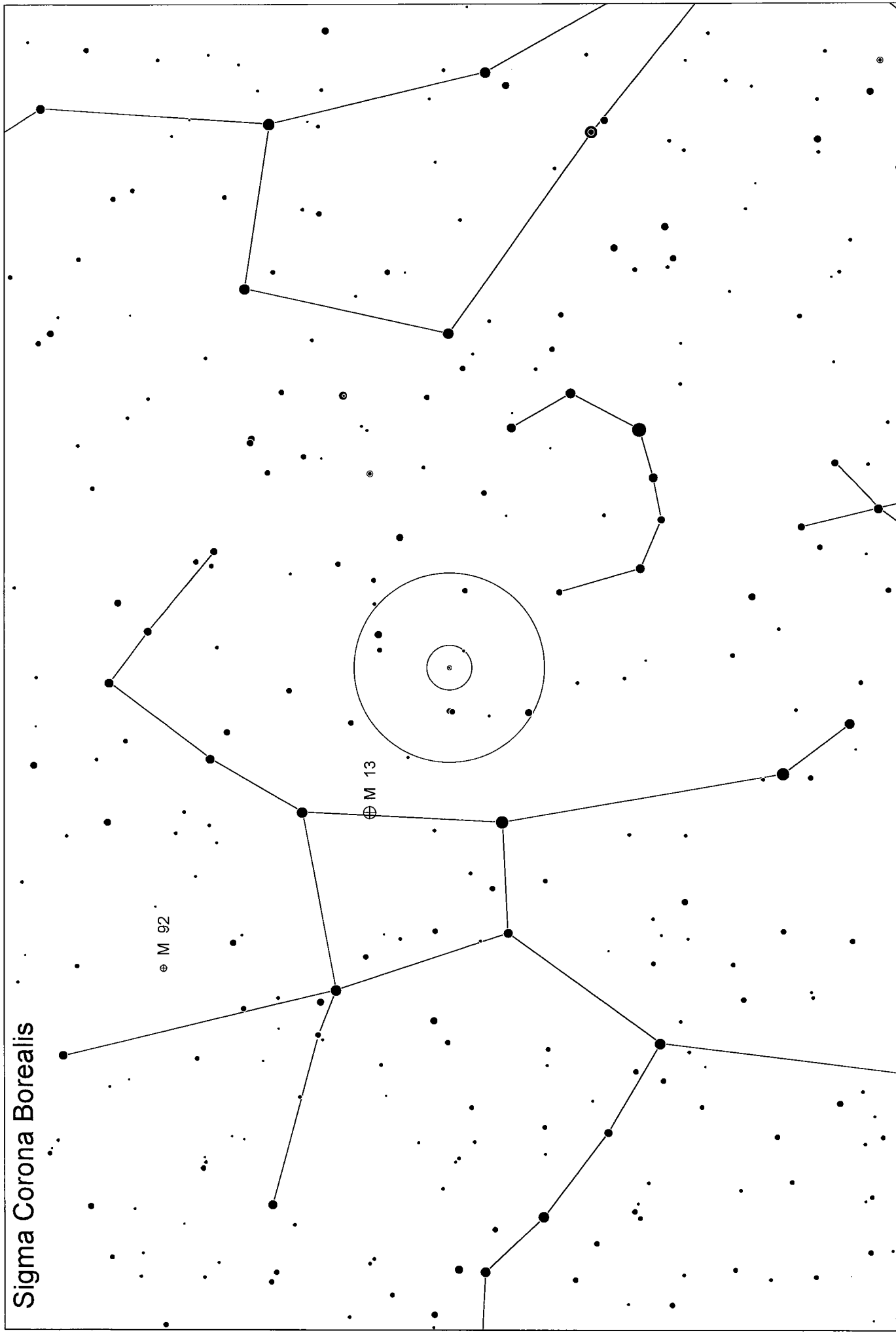
PGAO 2003-10-11 15h05m C: 16h12m -19°28' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC

MAG: 4.3, 6.4 SEP: 41" PA: 337 deg

Magnitude: : 0 1 2 3 4 5 6 Variable Double Comet Asteroid Planet

Nebula: Gx Oc Gc Pl Neb N+C Star Unk

Sigma Corona Borealis



PGAO 2003-10-11 16h09m C: 16h15m +33°51' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC

MAG: 5.6, 6.6 SEP: 6.2" PA: 233 deg

Magnitude: 0 1 2 3 4 5 6									
●	●	●	●	●	●	●	⊙	◆	④
Variable Double Comet Asteroid Planet									
Nebula: Gx Oc Gc Pl Neb N+C Star Unk									
○	⊖	⊕	⊗	□	⊞	+	x		

16 / 17 Draconis

pm:-0.009 0.027

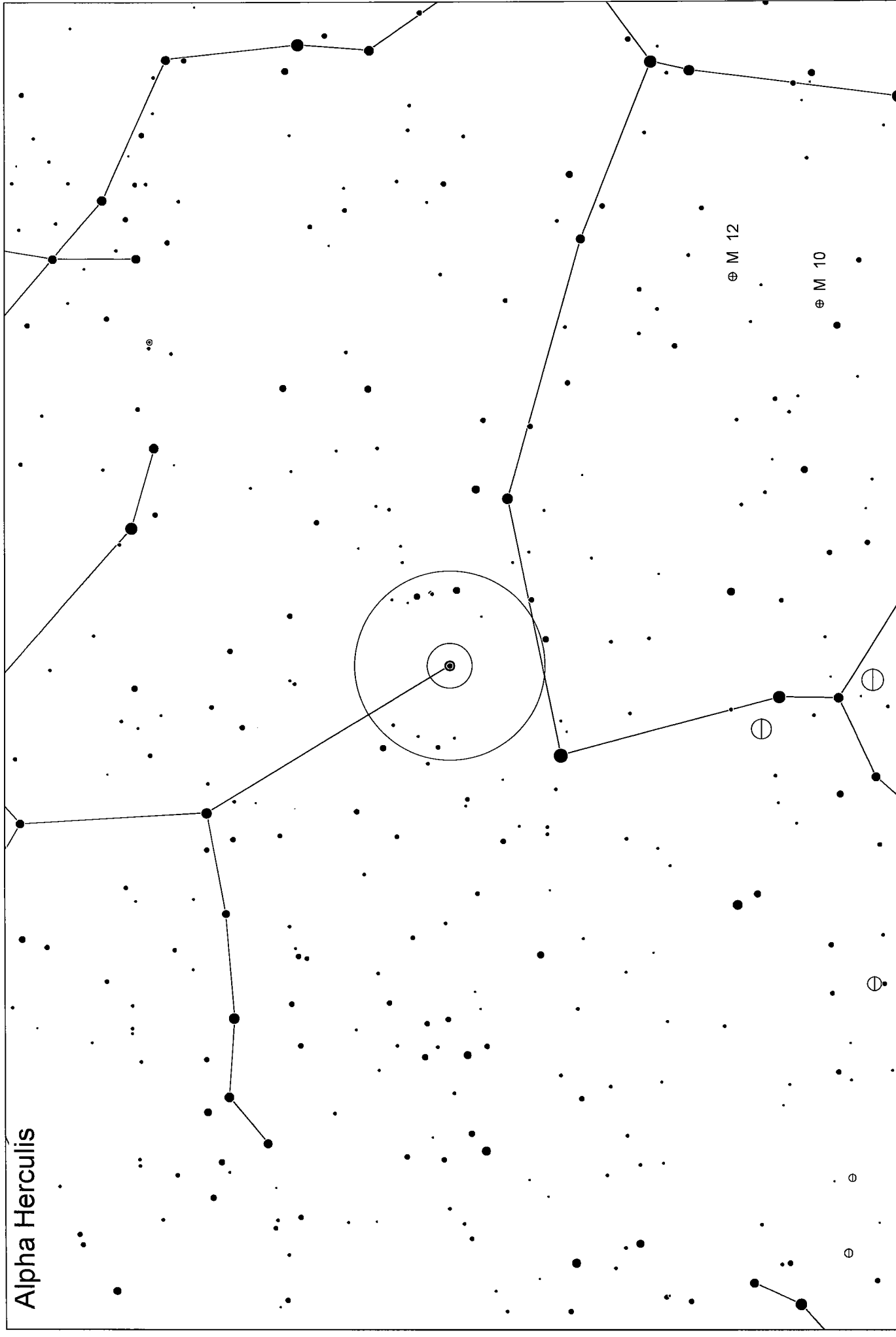
Magnitude: 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

This is a detailed star map of the constellation Mu Draconis. The map features a dense field of stars, with the primary stars connected by lines to form the constellation's outline. Two specific deep-sky objects are highlighted: M 13, a globular cluster, and M 92, another globular cluster. The constellation is labeled 'Mu Draconis' in the bottom left corner.

MAG: 5.7, 5.7 SEP: 2.0" PA: 42 deg

[illegible]

Alpha Herculis



PGAO 2003-10-11 14h13m C: 17h15m +14°23' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
17h14m38.90s +14°23'25.0" * HR 6406 HD156014 Fl: 64 Ba:Alp1 const:Her mV: 3.48 b-v: 1.44 sp: M5lb-II
MAG: 3.5, 5.4 SEP: 4.7" PA: 107 deg pm:-0.006 0.036 ;RASALGETHI; Ras Algethi

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
	●	●	●	●	●	●	●	⊙	●	☄	◆	♃

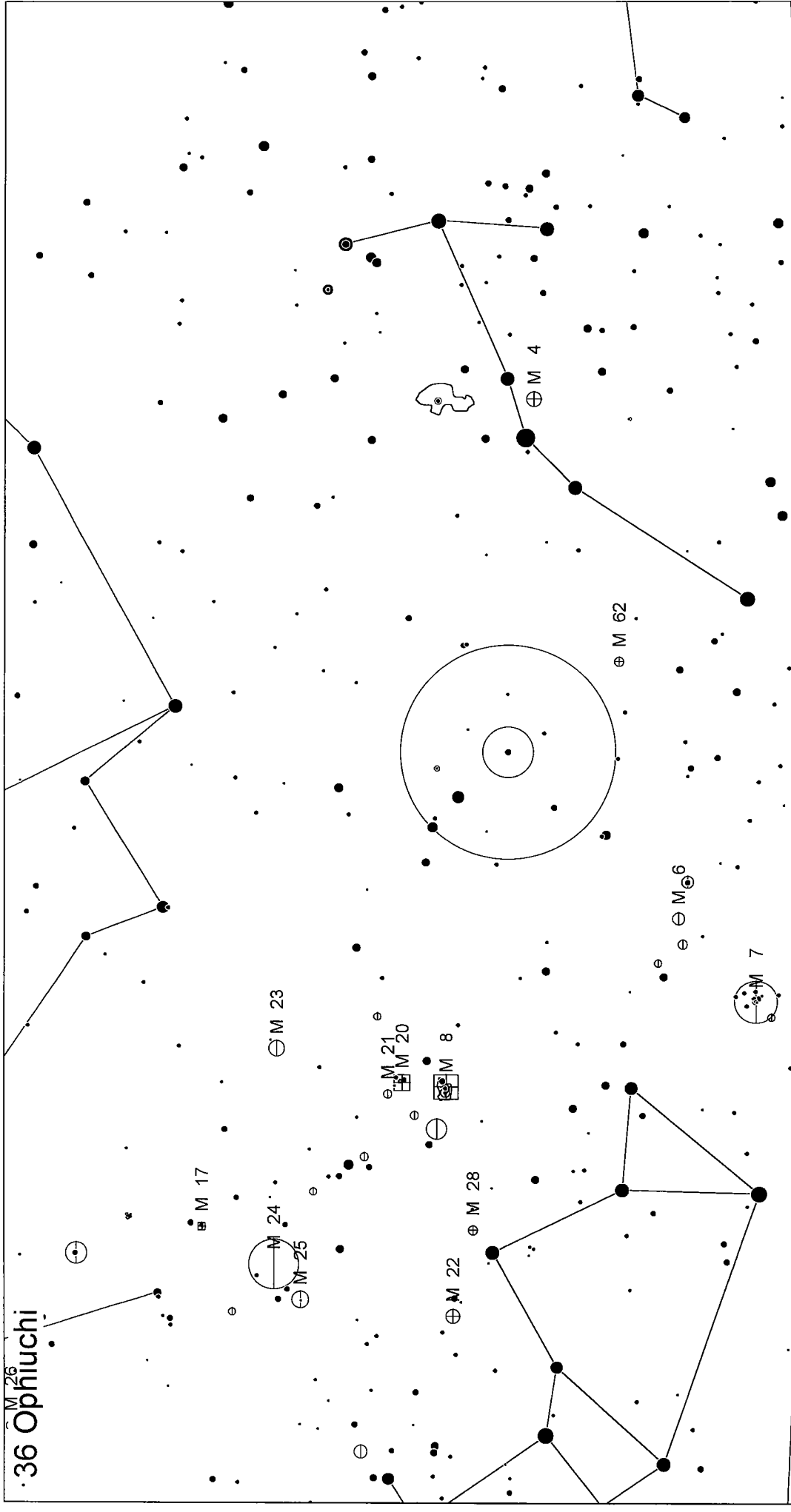
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk
	○	⊖	⊕	⊗	⊞	⊠	+	x

A detailed black and white star chart of the constellation Delta Herculis. The chart shows numerous stars of varying magnitudes, with the primary stars connected by lines to form the constellation's outline. A large circle is drawn around the central star, and a smaller circle is centered on the star labeled 'M 13'. The text 'Delta Herculis' is written vertically on the left side. The chart is framed by a double-line border.

17h15m01.90s +24°50'21.0" * HR 6410 HD156164 Fl: 65 Ba:Del const:Her mV: 3.14 b-v: 0.08 sp: A3IV

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{+}
planet
```

M 10

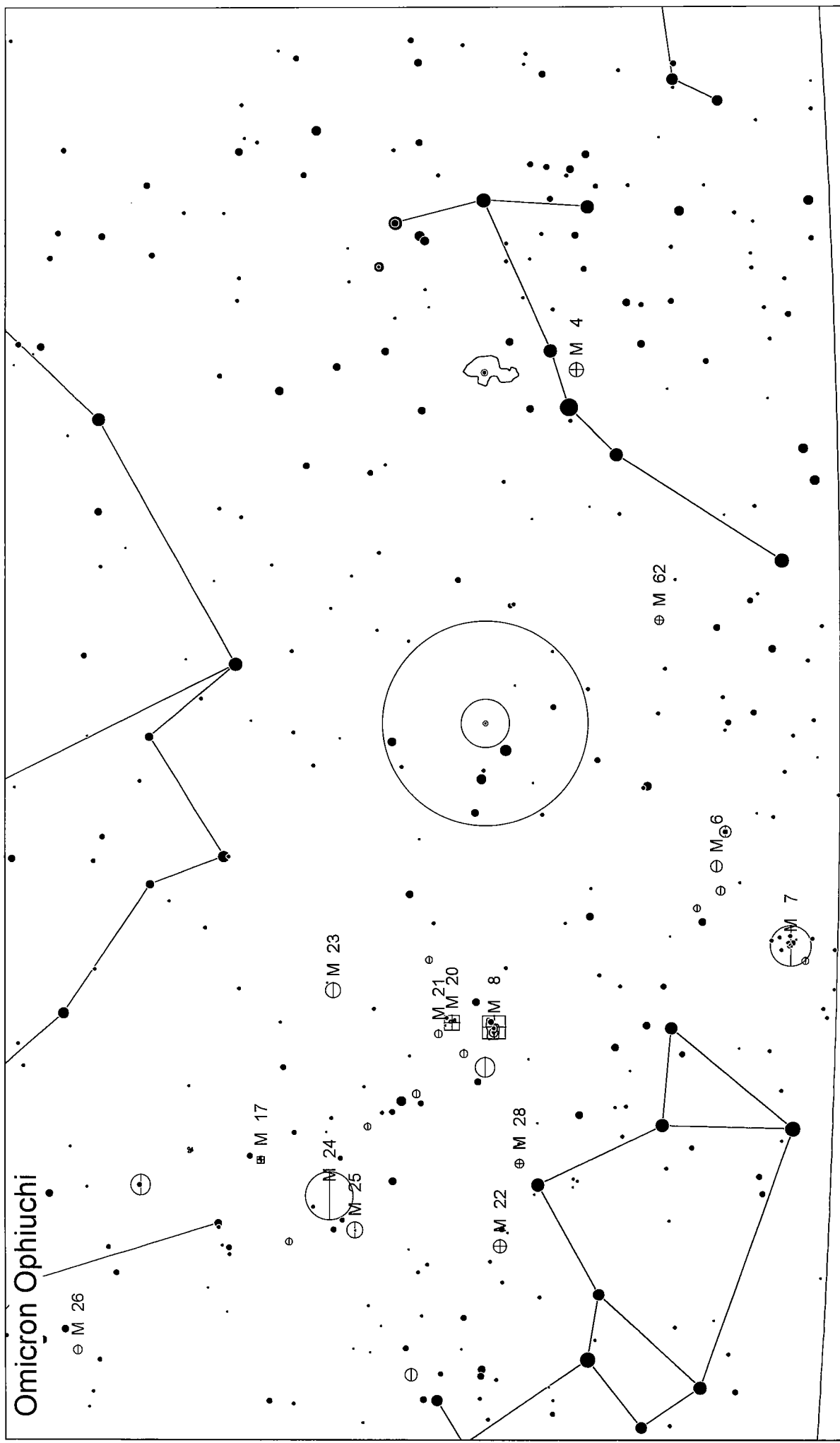


36 Ophiuchi

PGAO 2003-10-11 17h17m C: 17h16m -26°36' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
 17h15m20.80s -26°36'05.0" * HR 6402 HD155886 Fl: 36 Ba: const: Oph mV: 5.07 b-v: 0.85 sp: KOV pm: -0.491 -1.133
 MAG: 5.1, 5.1 SEP: 4.4" PA: 154 deg

Magnitude: 0 1 2 3 4 5 6	Variable	Double	Comet	Asteroid	Planet
Gx Oc Gc Pl Neb N+C Star Unk	+	+	+	+	+

Omicron Ophiuchi



PGAO 2003-10-11 17h17m C: 17h18m -24°17' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
 17h18m00.70s -24°17'13.0" * HR 6424 HD156349 FI: 39 Ba:Omi const:Oph mV: 5.20 b-v: 1.10 sp: K0II-III pm:-0.054 -0.008
 MAG: 5.4, 6.9 SEP: 10.3" PA: 355 deg

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Gc	Oc	Pi	Neb	N+C	Star	Unk				

This is a detailed star chart of the constellation Rho Herculis. The chart features a dense field of stars, with the primary stars of the constellation connected by lines to form its characteristic shape. Two specific deep-sky objects are highlighted with circles and labels: M 92, a globular cluster, and M 13, an open cluster. The constellation is labeled 'Rho Herculis' in the bottom left corner. The chart is oriented with North at the top.

[illegible]

Nu Draconis

⊕ M 92

PGAO 2003-10-11 17h17m C: 17h32m +55°10' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
17h32m16.00s +55°10'23.0" * HR 6555 HD159560 Fl: 25 Ba: Nu 2 const: Dra mV: 4.87 b-v: 0.28 sp: A4m
MAG: 4.9, 4.9 SEP: 62" PA: 312 deg pm: 0.148 0.056 ;Kuma

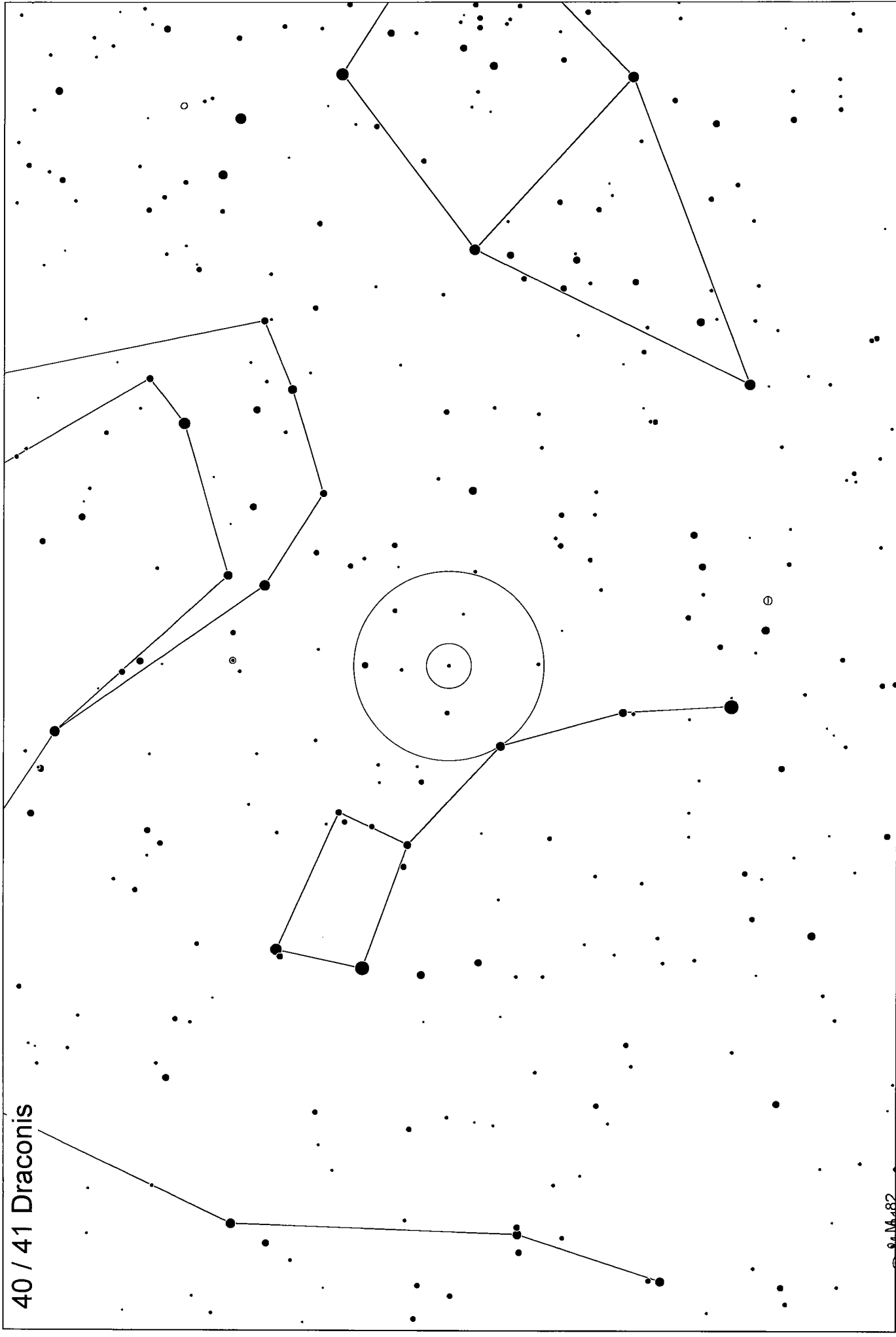
Magnitude: : 0 1 2 3 4 5 6 Variable Double Comet Asteroid Planet

Nebula: Gx Oc Gc Pl Neb N+C Star Unk

This is a detailed star chart of the constellation Psi Draconis. The chart features a dense field of stars, with the primary stars of the constellation connected by lines to form its characteristic shape. A central star is highlighted with concentric circles, indicating its significance. The constellation is labeled 'Psi Draconis' in the bottom left corner.

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[illegible]



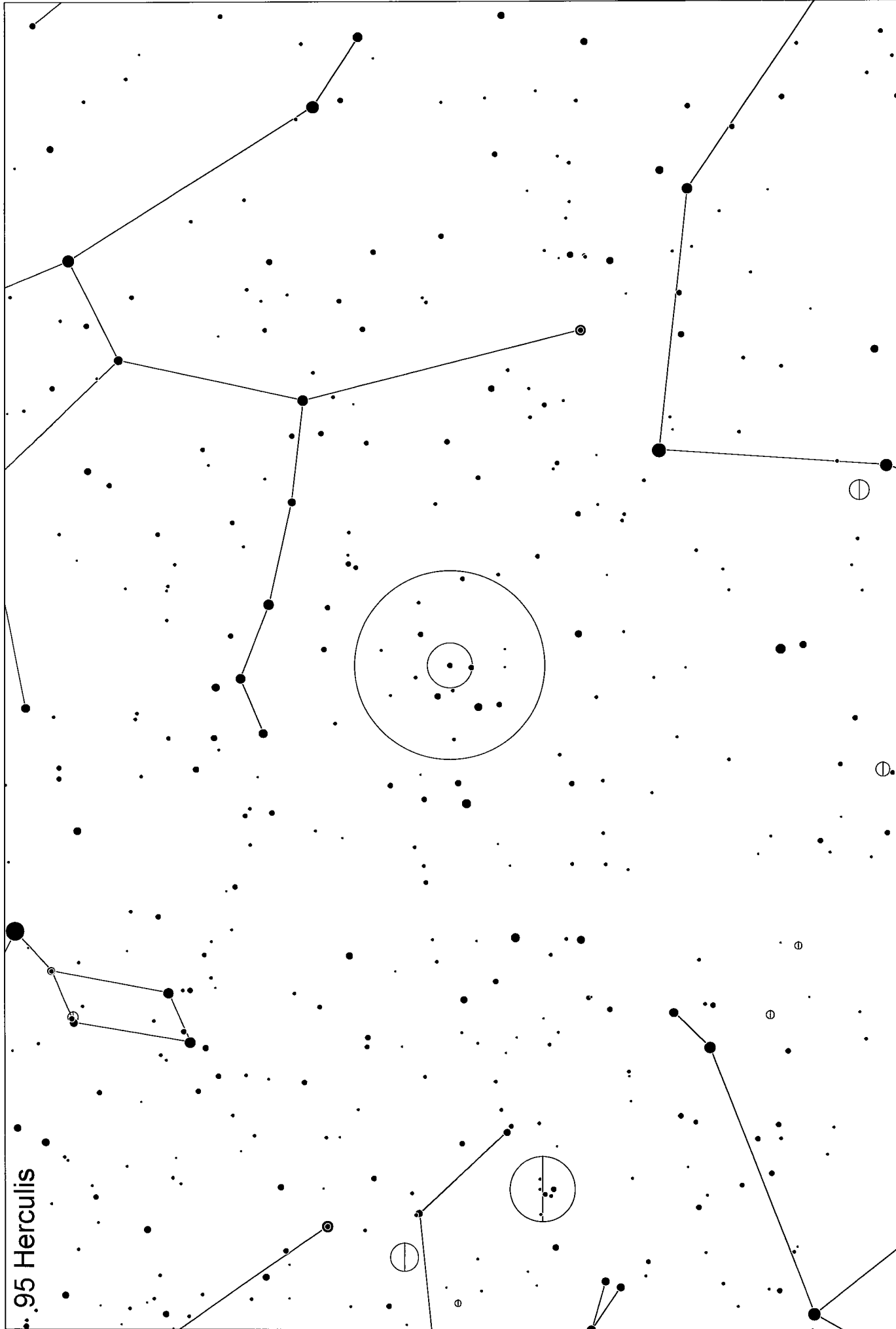
40 / 41 Draconis

M 10.82

PGAO 2003-10-11 17h17m C: 18h00m +80°00' L:+49°00' O:0° ARC HZ Cat: DSL BSC SAC
 18h00m09.20s +80°00'15.0" * HR 6810 HD166866 Fl: 41 Ba: const:Dra mV: 5.68 b-v: 0.50 sp: F7 pm: 0.042 0.122
 MAG: 5.7, 6.1 SEP: 19.3" PA: 232 deg

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

95 Hercules



PGAO 2003-10-11 17h17m C: 18h02m +21°36' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC 18h01m30.40s +21°35'44.0" * HR 6730 HD164669 Fl: 95 Ba: const: Her mV: 4.96 b-v: 0.12 sp: A5IIIIn pm: 0.012 0.035 MAG: 5.0, 5.1 SEP: 6.3" PA: 258 deg												
Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				
												M 1

Magnitude: 0	1	2	3	4	5	6	•	•	☉	☛	◆	♁	M 17
	☉	☉	☉	☉	☉	☉	☉	☉	☉	☉	☉	☉	
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk					

This is a detailed star chart of the constellation Epsilon Lyrae. The chart displays a large number of stars, with their relative positions and magnitudes indicated by their size and brightness. The constellation's boundaries are defined by lines connecting the primary stars. Key features include:

- Central Star System:** A prominent star system in the center, consisting of a large primary star and several smaller companions, highlighted by concentric circles.
- M 13:** A globular cluster located in the upper left quadrant, marked with a circle and the label "M 13".
- M 92:** Another globular cluster, located in the upper right quadrant, marked with a circle and the label "M 92".
- Epsilon Star System:** A star system in the lower right quadrant, marked with a circle and the label "Epsilon".
- Other Labels:** Several other stars are labeled with Greek letters (alpha, beta, gamma, delta, epsilon, zeta, eta, theta, iota, kappa, lambda, mu, nu, xi, omicron, pi, rho, sigma, tau, upsilon, phi, chi, psi, omega) and numbers (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100).

The text "Epsilon Lyrae" is written vertically on the left side of the chart.

pm: 0.017 0.059

Magnitude: 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula: Gx Oc Gc Pl Neb N+C Star Unk											

•Zeta Lyrae

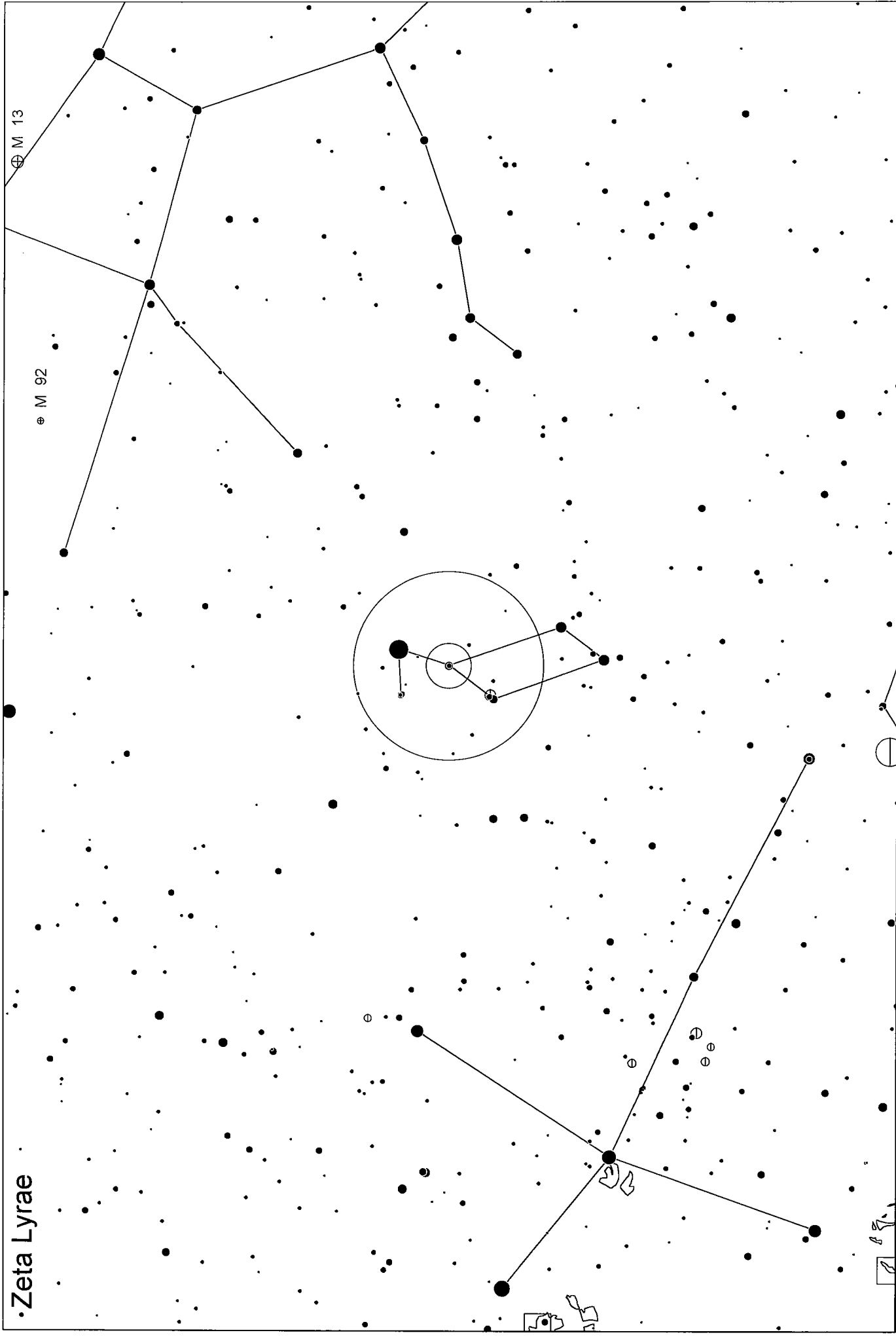
⊕ M 13

☾ M 92



PGAO 2003-10-11 17h17m C: 18h45m +37°37' L:+49°00' O:0° ARC HZ Cat: DSL BSC SAC
 18h44m46.40s +37°36'18.0" * HR 7056 HD173648 Fl: 6 Ba:Zet1 const:Lyr mV: 4.36 b-v: 0.19 sp: A4m
 MAG: 4.3, 5.9 SEP: 44" PA: 150 deg pm: 0.028 0.024

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
	●	●	●	●	●	●	●	○	●	☄	◆	♃
Nebula:	○	⊖	⊕	⊗	⊙	⊠	⊡	+	x			
	Gx	Oc	Gc	Pi	Neb	N+C	Star	Unk				



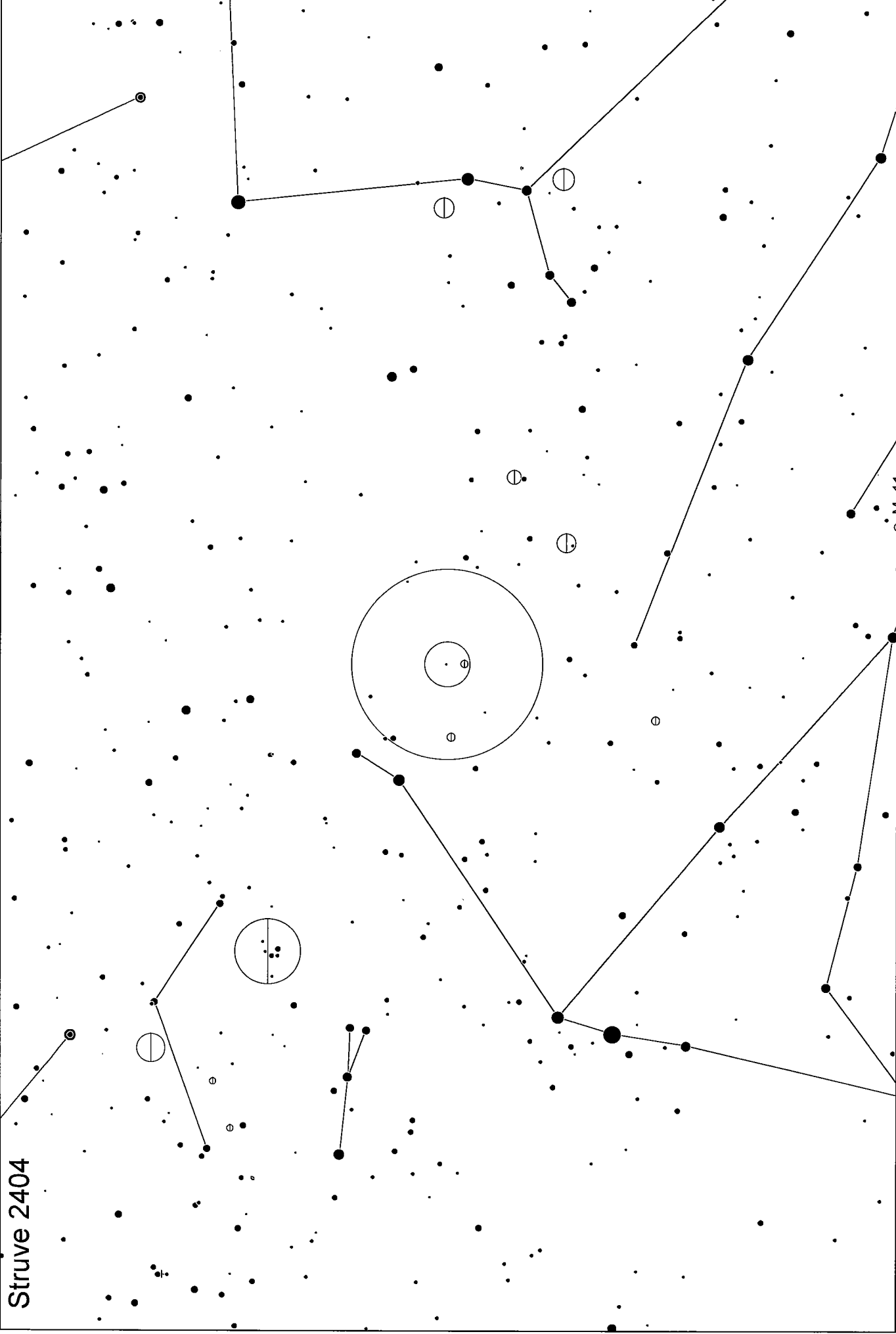
Beta Lyrae

18h50m04.80s +33°21'46.0" * HR 7106 HD174638 Fl: 10 Ba:Bet const:Lyr mV: 3.45 b-v: 0.00 sp: B8IIpe
MAG: 3.1 8.6 SED: 46" PA: 140 deg

MAG. 3.4, 8.0 SEP. 40 FA. 143 deg

								
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk

Struve 2404



PGAO 2003-10-11 17h17m C: 18h51m +10°57' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
18h50m45.60s +10°58'35.0" * HR 7099 HD174569 Fl: Ba: const: mV: 6.55 b-v: sp: K5III+K3III pm: 0.023 0.009
MAG: 6.9, 8.1 SEP: 3.6" PA: 183 deg

Magnitude: 0 1 2 3 4 5 6										Variable	Double	Comet	Asteroid	Planet	M 26
Gx Oc Gc Pl Neb N+C Star Unk										+	+	+	+	+	

Orion

Otto Struve 525

18h54m52.50s +33°58'07.0" * HR 7140 HD175635 Fl: Ba: const: mV: 6.02 b-v: 0.91 sp: G8III+A2 pm:-0.008 0.003

 $+A2$

6

11

Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk
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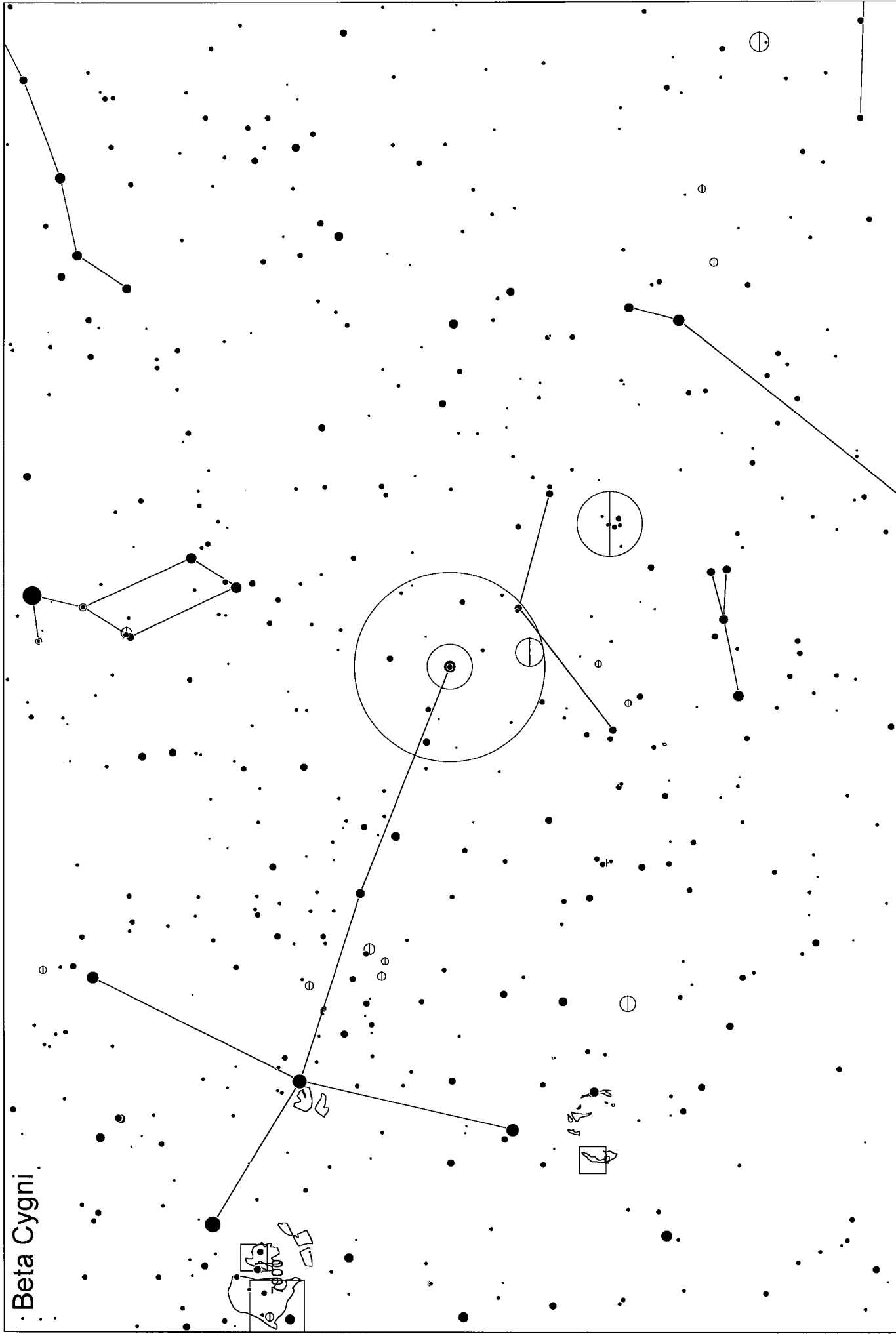
This is a detailed star chart of the constellation Theta Serpentis. The chart displays a dense field of stars, with the primary stars connected by lines to form the constellation's outline. Key features include a large circular region in the center, a smaller circle at the bottom left, and several labeled objects: 'Theta Serpentis' at the bottom left, 'e M 11' and 'e M 26' on the right, and 'Theta' at the top right. The chart is oriented with North at the top.

18h56m13.20s +04°12'13.0" * HR 7141 HD175638 Fl: 63 Ba:The1 const:Ser mV: 4.62 b-v: 0.17 sp: A5V
MAC: 4554 SED: 22.2" PA: 104 deg

Nebula: ☐ Gx ☐ Oc ☐ Gc ☐ Pl ☐ Neb ☐ N+C Star ☐ Unk

M 25

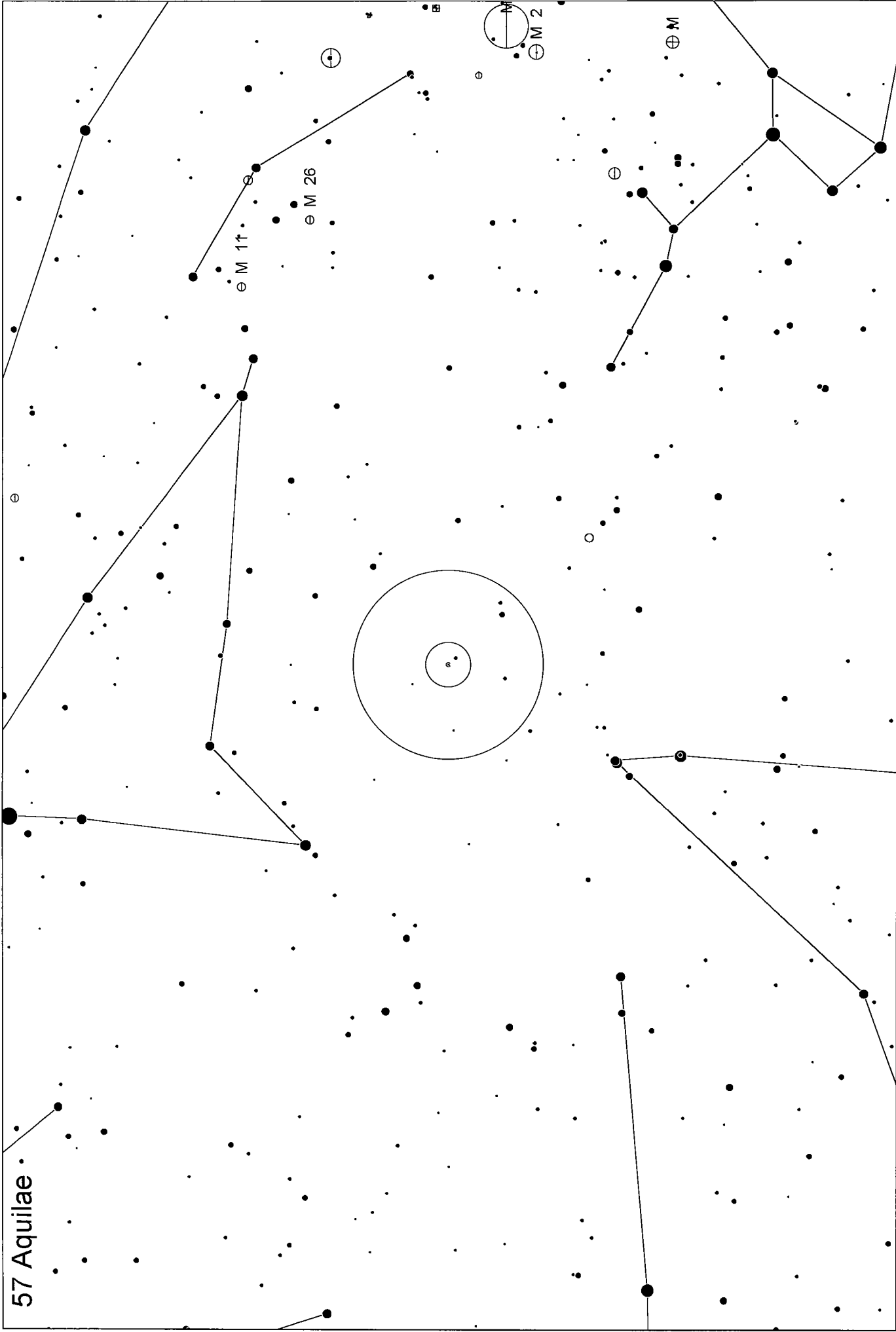
Beta Cygni



PGAO 2003-10-11 17h17m C: 19h31m +27°58' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
 19h30m43.30s +27°57'35.0" * HR 7417 HD183912 Fl: 6 Ba: Bet1 const: Cyg mV: 3.08 b-v: 1.13 sp: K3II+B9.5V pm: 0.002 -0.002 ALBIREO
 MAG: 3.1, 5.1 SEP: 34.4" PA: 54 deg

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	PI	Neb	N+C	Star	Unk				

57 Aquilae



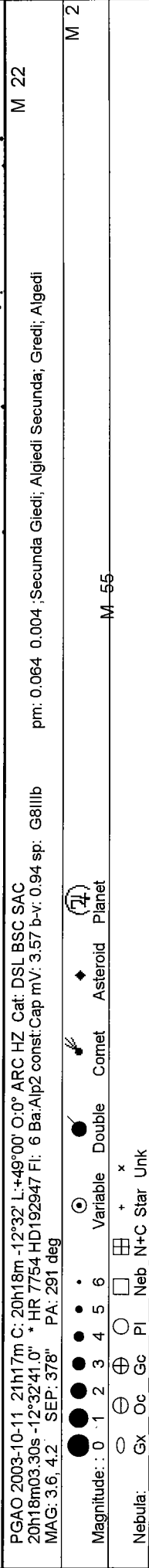
PGAO 2003-10-11 17h17m C: 19h55m -08°13' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
 19h54m37.60s -08°13'38.0" * HR 7593 HD188293 Fl: 57 Ba: const: Aql mV: 5.71 b-v: -0.08 sp: B7Vn pm: 0.010 -0.025
 MAG: 5.8, 6.5 SEP: 36" PA: 170 deg

Magnitude: 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula: Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

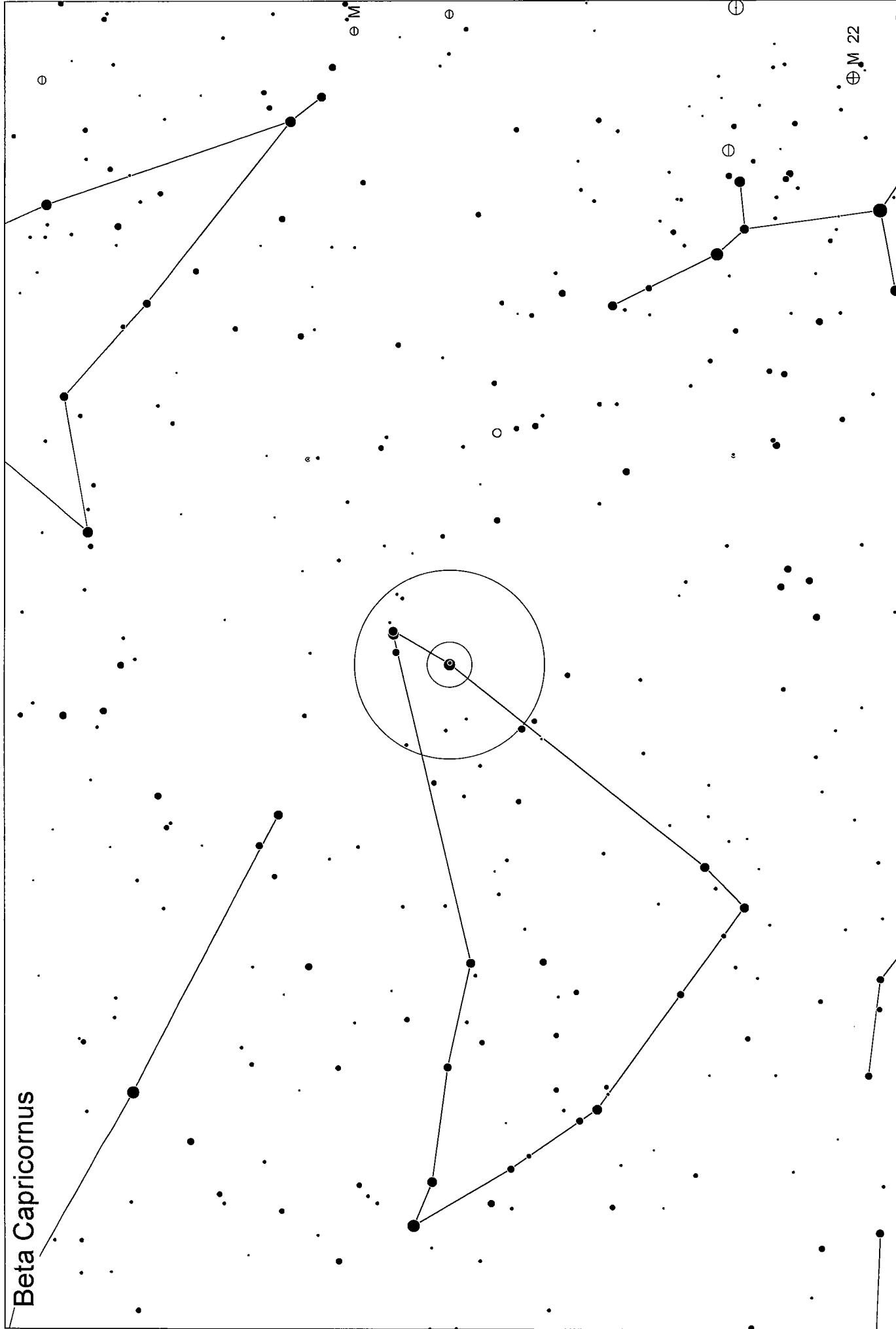
This is a detailed star chart of the constellation Cygnus. The chart features numerous stars of varying sizes, representing their relative magnitudes. Key stars are connected by lines to form the constellation's outline. Several deep sky objects are highlighted with specific symbols: a large circle with a central dot for the Great Dumbbell (M 39), a smaller circle with a central dot for the Little Dumbbell (M 42), and a circle with a cross for the Ring Nebula (M 57). The text '31 Cygni' is located in the bottom left corner. The chart is set against a background of a grid of stars, with some stars marked with circled crosses or other symbols. The overall layout is a rectangular field of view, typical of a star map.

PGAO 2003-10-11 17h17m C: 20h14m +46°45' L:+49°00' O:0° ARC HZ Cat: DSL BSC SAC
20h13m37.90s +46°44'29.0" * HR 7735 HD192577 Fl: 31 Ba: const:Cyg mV: 3.79 b-v: 1.28 sp: K2II+B3V
MAG: 3.8, 6.7, 4.8 SEP: 107", 337" PA: 173, 323 deg pm: 0.004 0.003

[illegible]

$\oplus M_2$ 

Beta Capricornus



PGAO 2003-10-11 21h17m C: 20h21m -14°46' O:0° ARC HZ Cat: DSL BSC SAC									
20h21m00.70s -14°46'53.0" * HR 7776 HD193495 Fl: 9 Ba:Bet const:Cap mV: 3.08 b-v: 0.79 sp: F8V+A0									
MAG: 3.4, 6.2 SEP: 206" PA: 267 deg									
pm: 0.042 0.002 ; Dabih Major; Beta2 = Dabih Minor									
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PGA0 2003-10-11 21h17m C: 20h47m +16°08' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC

20146m39.50s +16°07'27.0" * HR 7948 HD197964 Fl: 12 Ba:Gam2 const.Del mV: 4.27 b-v: 1
MAC: 45.55 SED: 0.6" PA: 268 deg

WAG: 4.5, 5.0 SER: 9.0 PA: 200 deg

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
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$\odot$	$\odot$	$\odot$
0	0	0

Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk
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This is a detailed astronomical chart of the constellation Cygnus. The chart features a dense field of stars of varying magnitudes, represented by dots of different sizes. Key features include:

- Constellation Boundaries:** The constellation Cygnus is outlined by a series of connected lines. Other constellations visible at the edges include 61 Cygni to the left, and parts of other constellations at the top and bottom.
- Major Stars:** Several stars are highlighted with larger dots or specific symbols. One star is labeled "M³⁹" with a circled cross symbol.
- Astronomical Features:**
 - A large circle with a smaller concentric circle inside is located in the lower-left quadrant.
 - A rectangular box highlights a specific region in the lower-left, containing a small figure of a person.
 - Another rectangular box is located in the lower-right, also containing a small figure of a person.
 - A line with a cross at its end points to a star in the upper-left.
 - A line with a cross at its end points to a star in the upper-right.
 - A line with a cross at its end points to a star in the lower-right.
- Labels and Symbols:**
 - The label "61 Cygni" is located in the bottom-left corner, with a line pointing to a star.
 - The label "M³⁹" is located in the lower-left, with a circled cross symbol.
 - Various other symbols, including circles with crosses and lines with crosses, are scattered throughout the chart.

pm: 4.136 3.203

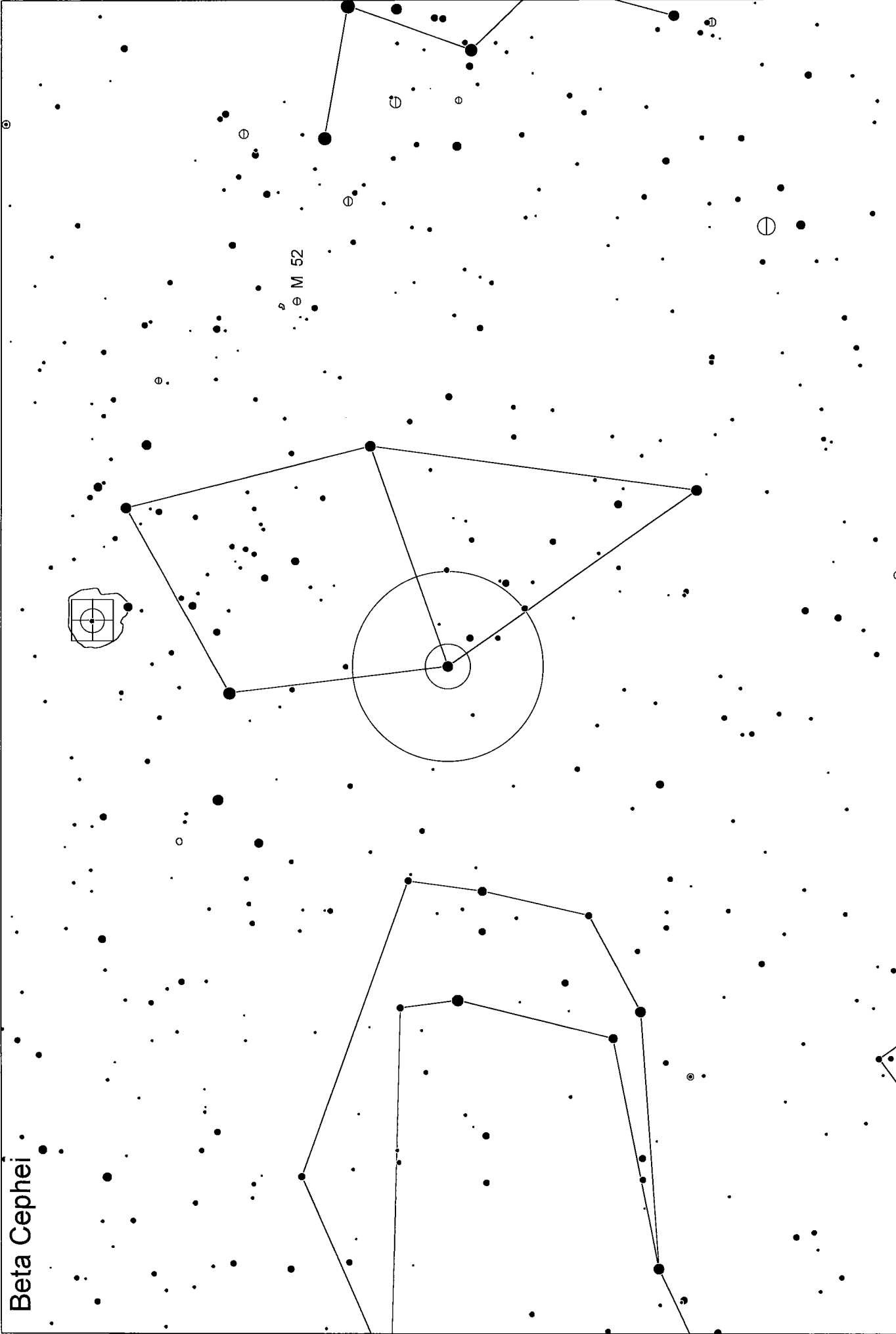
Magnitude: 0 1 2 3 4 5 6

Variable Variable Double Comet Asteroid Planet

7

Nebula: Gx ☐ Oc ☐ Gc ☐ Pl ☐ Neb ☐ N+C ☐ Star ☐ Unk

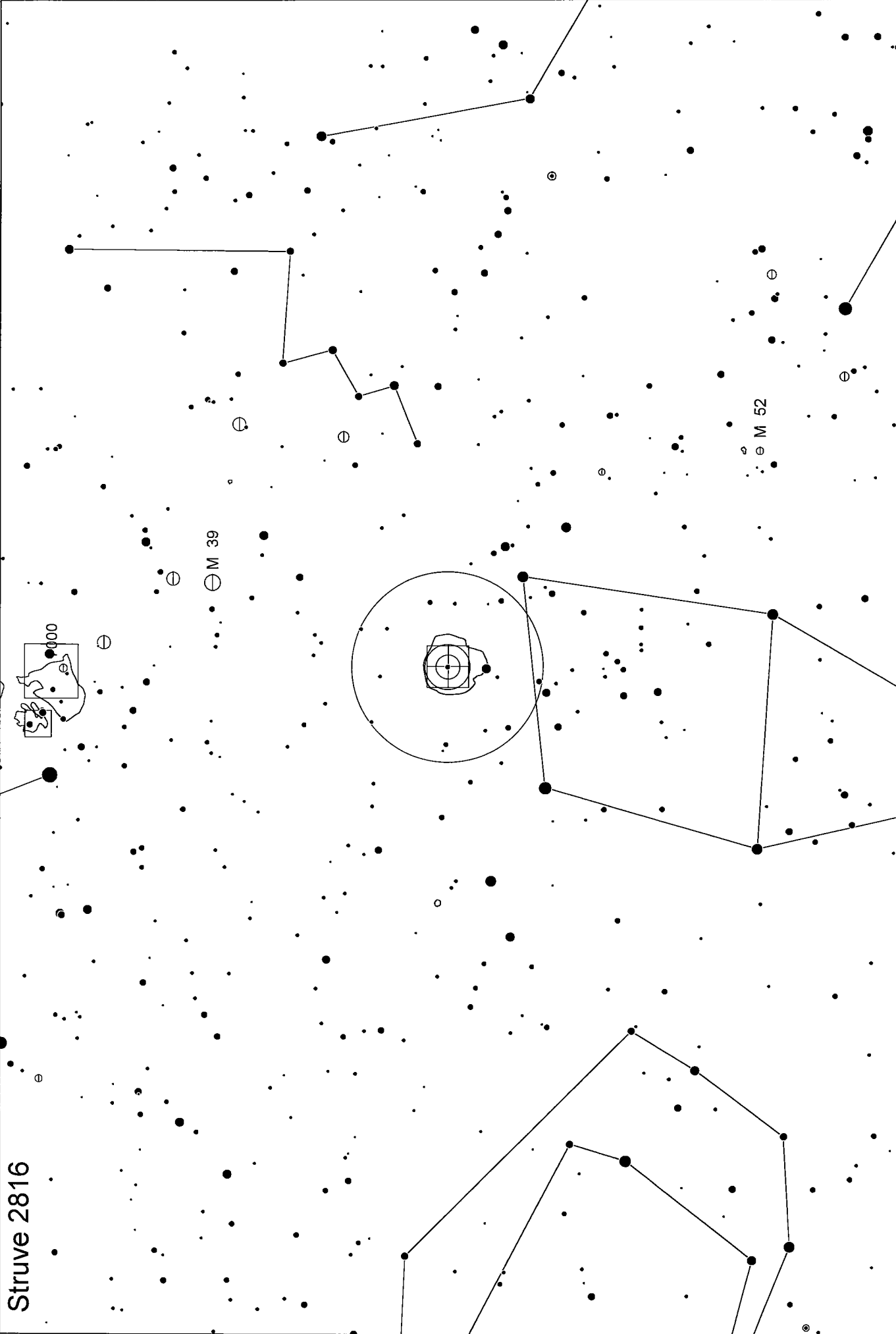
Beta Cephei



PGAO 2003-10-11 21h17m C: 21h29m +70°35' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
21h28m39.60s +70°33'39.0" * HR 8238 HD205021 Fl: 8 Ba: Bet const: Cep mV: 3.23 b-v: -0.22 sp: B1IV
MAG: 3.2, 7.9 SEP: 13.3" PA: 249 deg pm: 0.010 0.007 Alfrirk; Alphirk

Magnitude: 0 1 2 3 4 5 6										Variable	Double	Comet	Asteroid	Planet
Nebula: Gx Oc Gc Pl Neb N+C Star Unk														

Struve 2816



PGA0 2003-10-11 21h17m C: 21h39m +57°30' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC

21h28m39.60s +70°33'39.0" * HR 8238 HD205021 Fl: 8 Ba:Bet const:Cep mV: 3.23 b-v:-0.22 sp: B1IV
MAG: 5.6 7.7 7.8 SEP: 11 7" 20" PA: 121 339 deg

WHAO: 0.0, 1.7, 1.0, 0.1 : 11.7 , 20.1 A. 12.1, 0.09 deg

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet

Nebula:	Gx	Oc	Gc	Pl	+	x

pm: 0.010 0.007 ; Alfirk; Alphirk

1

◆ Asteroid (T) Planet

This is a detailed star map of the constellation Epsilon Pegasi. The map features a large number of stars, with the primary star, Epsilon Pegasi, prominently marked by a large circle and labeled 'ε M 15'. Other stars are labeled with Greek letters and numbers, such as 'ε M 2' and 'ε M 1'. The constellation's boundaries are defined by lines connecting the main stars. The background is filled with a dense field of stars, representing the surrounding sky.

21h44m11.20s +09°52'30.0" * HR 8308 HD206778 Fl: 8 Ba: Eps const: Peg mV: 2.39 b-y: 1.53 sp: K2lb

MAG: 2.4, 8.4 SEP: 142" PA: 320 deg

2

Star Un

pm: 0.209 0.085 ;Alkurhah; Al Kirdah; Kurhah

MASS. 4:4, 0.3 3LF. 1.1 FA. 211 deg

Nebula:	Gx	Oc	Gc	PI	Neb	N+C	Star	Unk
							+	x

This is a detailed star chart of the constellation Zeta Aquarii. The chart features a dense field of stars, with the primary stars of the constellation connected by lines to form its characteristic shape. Two specific deep-sky objects are highlighted: M 2, a globular cluster, and M 15, another globular cluster. The constellation is labeled 'Zeta Aquarii' in the bottom left corner. The chart is oriented with North at the top.

22h21m39.40s -01°23'14.0" * HR 8518 HD212061 Fl: 48 Ba:Gam const:Aqr mV: 3.84 b-v:-0.05 sp: A0V
MAC: 12.45 SED: 1.8" PA: 266 deg

MAG. 4.3, 4.3 SEP. 1.0 PA. 200 deg

Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk

This is a detailed astronomical chart of the constellation Delta Cephei. The chart displays a dense field of stars, with several stars connected by lines to form the constellation's outline. Key features include a large circle around a central star, a smaller circle around a star labeled 'e M 39', and a small square box around a star labeled 'e M 52'. The text 'Delta Cephei' is written vertically on the left side.

PGAO 2003-10-11 21h17m C: 22h29m +58°26' L: +49°00' O:0° ARC HZ Cat: DSL BSC SAC
22h29m10.30s +58°24'55.0" * HR 8571 HD213306 Fl: 27 Ba:Del const:Cep mV: 3.75 b-v: 0.60 sp: F5Ib-G2Ib
MAG: 3.9, 6.3 SEP: 41" PA: 192 deg pm: 0.015 0.001

Magnitude	0	1	2	3	4	5	6		
								•	
								◉	Variable
									Double
									Comet
								◆	Asteroid
									Planet

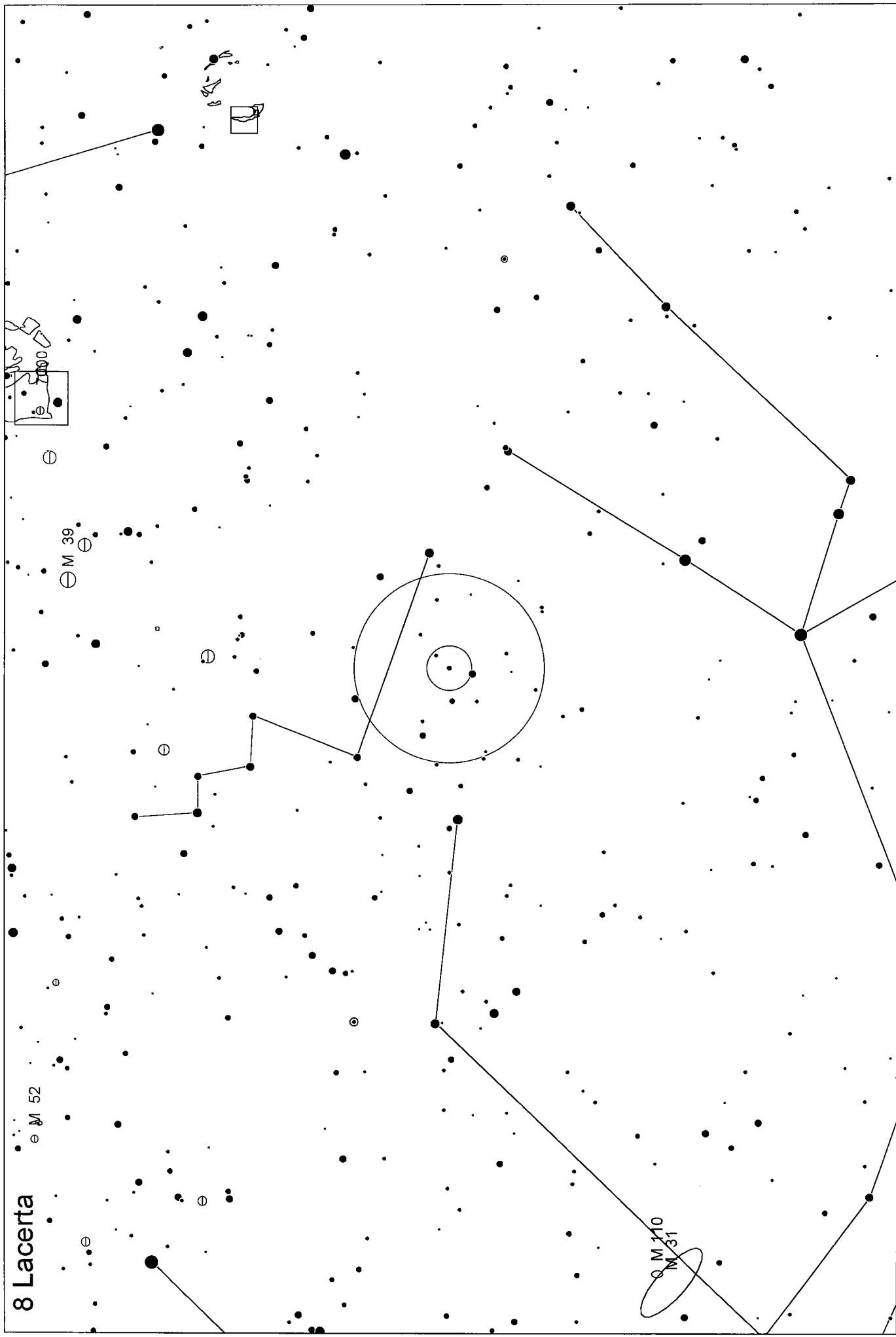
[illegible]

WAS. 09, 0.3 SER. 41 PA. 19Z uey

M 110
M 31

8 Lacerta

☾ M 52

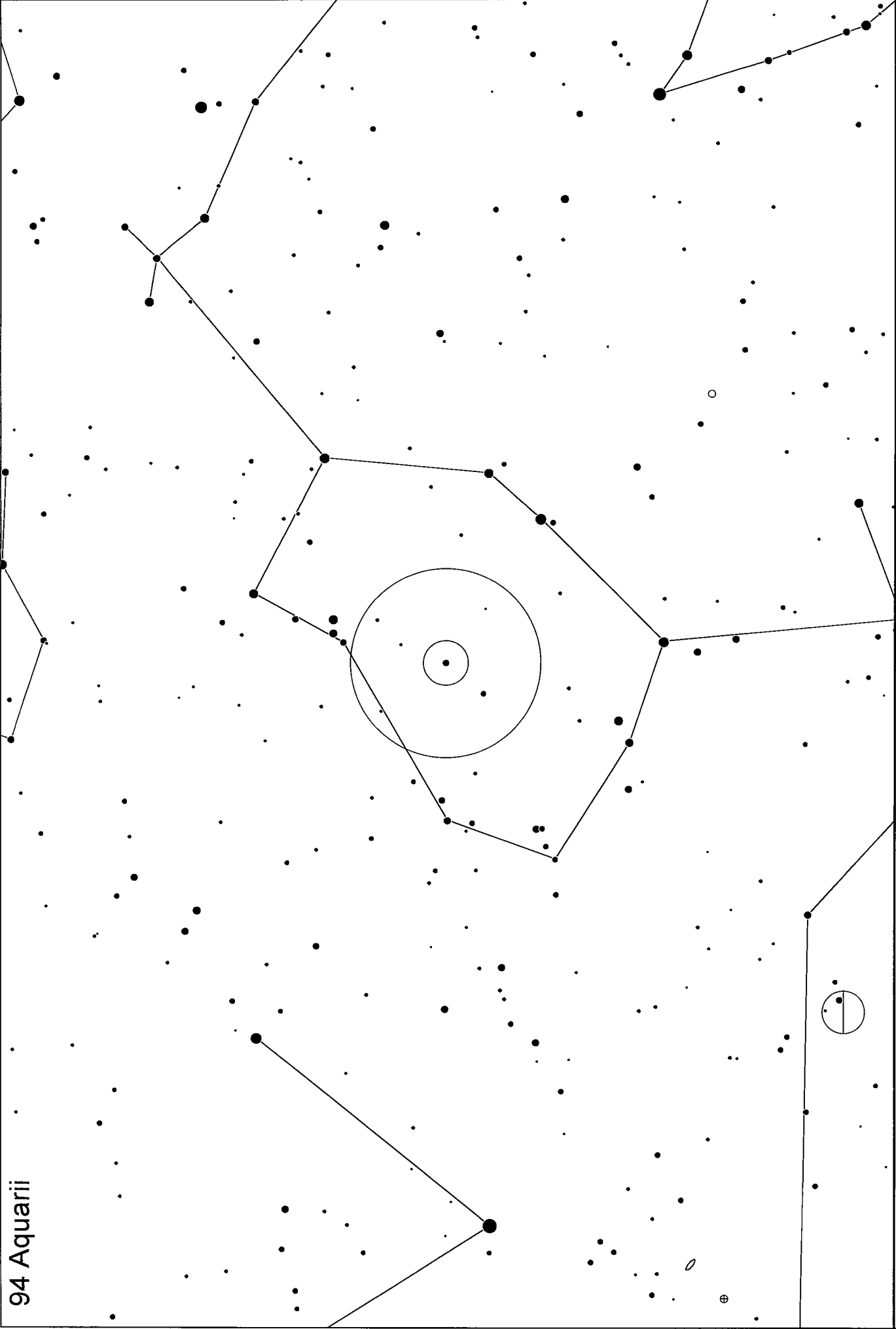


☾ M 110
☾ M 31

PGAO 2003-10-11 21h17m C: 22h36m +39°39' L: +49°00' O: 0° ARC HZ Cat: DSL BSC SAC
22h35m52.30s +39°38'03.0" * HR 8603 HD214168 Fl: 8 Ba: const: Lac mV: 5.73 b-v: -0.15 sp: B2Ve pm: 0.005 -0.006
MAG: 5.7, 6.5 SEP: 22.4" PA: 186 deg

Magnitude: 0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
☾	●	●	●	●	●	●	○	●	☾	◆	♃
☾	☾	☾	☾	☾	☾	☾	☾	☾	☾	☾	☾
Gx	Gx	Gx	Gx	Gx	Gx	Gx	+	+	+	+	+
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk			

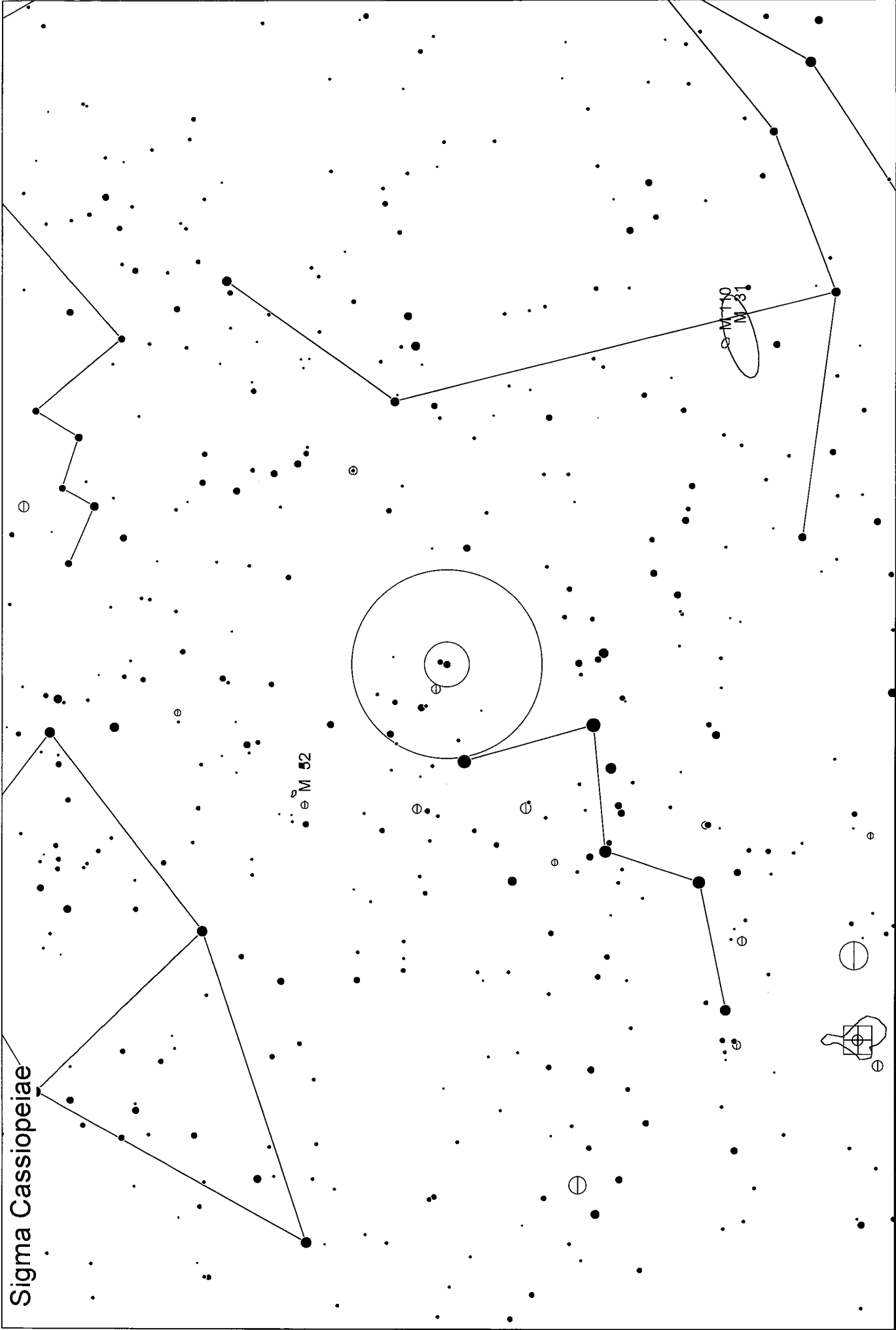
94 Aquarii



PGAO 2003-10-11 0h22m C: 23h19m -13°26' L:+49°00' O:0° ARC HZ Cat: DSL BSC SAC
 23h19m06.70s -13°27'32.0" * HR 8866 HD219834 Fl: 94 Ba: const:Aqr mV: 5.08 b-v: 0.80 sp: G5IV
 MAG: 5.3, 7.3 SEP: 12.7" PA: 350 deg pm: 0.298 -0.101

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				

Sigma Cassiopeiae



PGAO 2003-10-11 21h17m C: 23h59m +55°47' L:+49°00' O:0° ARC HZ Cat: DSL BSC SAC
 23h59m00.50s +55°45'18.0" * HR 9071 HD224572 Fl: 8 Ba:Sig const:Cas mV: 4.88 b-v:-0.07 sp: B1V
 MAG: 5.0, 7.1 SEP: 3" PA: 326 deg

pm: 0.009 -0.004

Magnitude:	0	1	2	3	4	5	6	Variable	Double	Comet	Asteroid	Planet
Nebula:	Gx	Oc	Gc	Pl	Neb	N+C	Star	Unk				