Texas Star Party
Advanced Observing Program

Years 2019 to 2026
Part D

List created by Larry Mitchell

Star charts compiled by Alvin Huey

Table of Contents

Introduction

This is a ***quick*** compilation of all Texas Star Party Advanced Observing (AO) lists compiled by Larry Mitchell to encourage you to go out and challenge yourself to seek them out visually through the eyepiece.

As Larry said, ***please star hop to the object versus using a computer or a Goto system***. You will learn the sky well if you do that. Use the upper left chart (or top chart) as the first step to point your telescope in the right place, then use the bottom chart with your finder scope or a low-power eyepiece to zero in on the object. The provided DSS image is typically 15' (or more for extended objects). ***Since this is a quick compilation, I didn't take the time to notate the actual field, but this gives you more than enough information to find the object.***

Each "chapter" is a year, and each PDF contains six or seven years. The first volume is from 2000 to 2006, the second is from 2007 to 2012, the third is from 2013 to 2018, and the fourth is 2019 to 2026. The 2019 to 2021 Advanced Observing Lists are curated lists of the best of the best of 2000 to 2018 AO programs.

I should note several things in this ***quick*** compilation.

- Each year, the original TSP AO list by Larry is provided at the beginning of each chapter.
- Many of the objects in Larry's lists are in one or more of our observing guides, so I merely copied/pasted from them, so some charts may be inconsistent in formatting from page to page, but captures the essence of the object.
- I have included the **Urano 2** (Uranometrica 2000.0, the Second Edition) and the interstellarium Deep Sky Atlas (**iDSA**) page numbers. The object may not necessarily be plotted on the charts, but the page number references the part of the sky where the object is located.
- A few AO lists are entirely captured in one or more of our guides, so I included a table with page numbers of the corresponding guide. For example, the 2004 AO program is for globular clusters; the entire AO list is in the globular cluster guide. Same with 2010 super-thin galaxies.
- This compilation is only available as a PDF.

The Texas Star Party - Advanced Observing Program - 2019

20 Year Anniversary

"The Best of the Advanced Observing Programs"

This year, 2019, marks the twentieth year of the Texas Star Party Advanced Observing Programs. The Advanced Observing Program was initiated to educate and challenge observers to locate and observe those objects they might have considered too difficult, if not impossible, to find and/or see visually beforehand. There is no better place to push the visual limit than under the dark transparent West Texas sky. Too often observers stop at the *"NGC Limit"* and never try to locate objects that begin with names like *Arakelian, Minkowski, Palomar or Sanduleak*. Such *Name Intimidation* is nothing more than becoming overwhelmed by the seemingly exalted difficulty of the object merely due to its name. Most of the objects on this year's list can be seen with small to average sized telescopes.

The listed objects are best located by careful and precise star-hopping. It is most imperative that the observer know *exactly* where in the field to look when the object is located, especially if some items turn out to be truly "light challenged" in their particular telescope. A few of these objects are faint and tenuous, so try various magnifications on these. By using a combination of averted and direct vision along with a degree of patience - eventually the object will be seen….Give the sky a chance and it will come to you. The standard observing rule is if you think you see the object at least three times, then you probably Really Did See It - Log it - and go on to the next object. Please refer to the handout for a star finder chart of the object, and something about the object, or something pertaining to the object…..Each has a story to tell.

This year's advanced program concentrates on some of the more interesting and brighter objects that have been listed over the past 19 years. Objects have been listed from each of the previous year's listings with some years more heavily represented than others. Please ignore the name intimidation factor, as only 8 NGC objects are listed, yet most of these objects may be observed in moderately sized telescopes. In planning your observations, pay attention to both the listed magnitudes and the object size, which will give an indication of the surface brightness of each object. However as we visual observers know all too well, the only way to know for sure if something is visible, on that particular night and in that specific telescope, is to LOOK for yourself. Adopt the theory, that within reason anything may be seen, until you have visually proven otherwise. The subject of last year's observing program, Edward Emerson Barnard, is a good mentor for everybody. Several of his discoveries were made with a telescope as small as 5 inches, yet these objects had all been passed up by other visual and professional astronomers with much larger instruments.

There are 40 deep sky objects on the observing list, and only 20 objects are required to obtain an observing pin. Even if some of the objects were previously observed in prior years, they must be observed this year to get a pin. As always, some of these objects are easy and some will challenge even the best of you. As astronomers, we are privileged that we get to view these objects that most people do not even know exists. I urge you to try some of the more seemingly difficult objects, as you may be surprised with your accomplishments. With patience and good sky conditions this list is certainly well within the range of all observers, beginner or advanced, with small or large telescopes, who desires a

TSP Advanced Observing Pin - From The One and The Only - The TEXAS STAR PARTY.

1. Any telescope may be used or any combination of telescopes.
2. Location by **Star Hopping** is Preferred - The only way to know where an object is in the heavens is to go and find it. *"Star Hop and be Educated"*. Maybe next time you can locate it without a chart, from memory - Always the Best Way.
3. An Advanced Observing Pin will be awarded to those who observe any 20 of the listed objects during TSP.
4. Observation programs from previous years may be completed for appropriate pins.
5. Observations of at least 20 objects may be turned in to Larry Mitchell anytime during the Star Party.

To those of you who only complete part of the list, but who have worked hard at it, you have successfully completed the spirit of the program. You have improved your observing skills, learned something about the night sky and hopefully enjoyed yourself….And you can always get that observing pin next year. Many people have enthusiastically stated how amazed they were at themselves - For locating and observing these objects themselves and with their own equipment.

< EXPAND YOUR OBSERVABLE LIMITS - THIS IS WHAT THE ADVANCED PROGRAM IS ALL ABOUT >

I hope you enjoy this challenge as much as I have and that it gives you a new sense of enjoyment and confidence in your abilities to successfully view – with your own eyes - Our Magnificent Universe.

LARRY MITCHELL : **Chairman – TSP Advanced Observing Program - 2019**

TSP Advanced Observing Program - Year 2019
Best of the TSP Obscure Universe -- Twentieth Year
Observe Any 20 Objects (This Year) - Receive a 20 Year Pin

Object		Type	Coord J2000	Const.	Mag.	Size	LYrs	Year	U-1
☐Hickson 40	Arp 321	Gal Cluster	09 38 53.4 – 04 50 55	Hya	13.8-17.3v	2.3' x 1.4'	305 m	2002	233
☐Abell 33		PN	09 39 09.1 – 02 48 32	Hya	12.6v	4.5'	2,000	2012	233
☐Frosty Leo	IRAS9371+1212	PN	09 39 53.6 + 11 58 54	Leo	10.97v	33" x 27"	9,800	2003	188
☐Holmberg IX	UGC5336	Gal	09 57 33.0 + 69 02 36	UMa	14.10(V)	3.0 x 2.5'	5.5 m	2011	23
☐Leo I	Regulus Dwf	DGal	10 08 27.5 + 12 18 27	Leo	10.0(V)	9.8 x 7.4'	815,000	2008	189
☐Coddington's Nebula,	IC2574	Gal	10 28 22.5 + 68 24 59	UMa	10.87(V)	13.2 x 5.3'	12.4 m	2007	24
☐NGC3314 A/B		Illusion	10 37 12.8 – 27 41 00	Hya	14.1/13.8	1.6' x 0.7'	217 m	2013	325
☐Hickson 56,	PGC35618	Gal Group	11 32 36.8 + 52 56 00	UMa		2.6' x 1.5'	380 m	2001	47
☐Arakelian 308	IC719	Gal	11 40 18.5 + 09 00 34	Vir	13.6	1.2 x 0.3'	85 m	2016	192
☐Leo Cluster	Abell 1367	Gal Group	11 44 30.0 + 19 50 00	Leo	13.7	100' x 100'	330 m	2009	147
☐Arp 18	NGC4088	Gal	12 05 34.1 + 50 32 23	UMa	11.2b	5.3 x 2.1'	40 m	2005	47
☐NGC4244	IC3087	SThin Gal	12 17 29.7 + 37 48 26	CVn	13.9	17.7' x 1.9'	12.0 m	2010	107
☐UGC7321	Kara 524	SThin Gal	12 17 34.1 + 22 32 27	Com	14.1	5.5' x 0.3'	20.0 m	2010	148
☐Mitchell's Object	LEDA2283644	Gal pair	12 17 48.2 + 46 34 50	CVn		35" x 26"	770 m	2002	74
☐Markarian 205	PGC39975	QSO	12 21 44.1 + 75 18 39	Dra	12.8	0.3' x 0.3'	1.2 Bill	2001	9
☐HK 155	Knot in M61	HII	12 21 56.6 + 04 29 28	Vir	--	20" x 20"	50 m	2011	238
☐Brosch 1		Asterism	12 33 19.5 – 00 38 56	Vir	--	0.7'	--	2017	239
☐UGCA311	MCG-1-33-60	SThin Gal	12 57 46.7 – 09 37 56	Vir	13.5	3.1' x 0.3'	69.3 m	2010	284
☐Abell 36	PK318+41.1	PN	13 40 41.3 – 19 52 57	Vir	13.0p	6.0' x 5.0'	780	2012	331
☐AM 1352-263	ESO510-13	Gal	13 55 04.3 – 26 46 48	Hya	13.4p	2.0' x 1.2'	160.6 m	2002	331
☐Abell 37	PK326+42.1	PN	14 04 25.9 – 17 13 40	Vir	13.9v	54" x 54"	6,000	2012	331
☐NGC5907	UGC9801	SThin Gal	15 15 53.9 + 56 19 38	Dra	11.1	12.9' x 1.3'	31.0 m	2010	50
☐Corona Cluster	Abell 2065	Gal Croup	15 22 42.0 + 27 43 00	CrB	16.5	22' x 22'	1.0 Bill	2009	154
☐Arp 91	NGC5953 / 54	Gal Pair	15 34 32.4 + 15 11 41	Ser	12.45(V)	1.6 x 1.3'	93.0 m	2005	199
	NGC5954	Gal Pair	15 34 35.0 + 15 12 12		12.9	1.2' x 0.5'	91.0 m	2005	199
☐IC4553	Arp 220	Sy 2 Gal	15 34 57.3 + 23 30 11	Ser	13.88(V)	1.5 x 1.2'	250.0 m	2001	154
☐Abell 2152 - Arc		Grav-Lens	16 05 29.7 + 16 26 35	Her	13.8 (10th)	37.0'	1.5 Bill	2012	200
☐Kazarian 73	NGC6217	Gal	16 32 38.7 + 78 11 56	UMi	13.88(V)	3.0 x 2.4'	63.5 m	2016	11
☐Markarian 501	UGC10599	BL Lac	16 53 52.2 + 39 45 38	Her	13.3(V)	1.2 x 0.9'	450 m	2001,15	80
☐Minkowski 2-9	The Butterfly	PN	17 05 37.9 – 10 08 32	Oph	13.2	50" x 20"	2,100	2003	292
☐Nassau 1	Sand 2-179	PN	17 12 51.9 – 03 16 00	Oph	13.4p	5.0"	--	2003	247
☐Haute-Provence 1		GC	17 31 05.2 – 29 58 54	Oph	11.6(V)	1.2'	45,966	2004	376
☐Terzan 1		GC	17 35 47.0 – 30 28 46	Sco	15.9	2.4'	16,950	2004	376
☐Sanduleak 2-237	PK 11+7.1	PN	17 44 42.1 - 15 45 12	Ser	--	28" x 7.0"	6,879	2003	293
☐Hubble 5	Wray 16-310	PN	17 47 56.2 – 29 59 40	Sgr	10.8(V)	15.0"	10,500	2003	377
☐Haro 1-36	Sanduleak 2-249	PN	17 49 48.2 – 37 01 28	Sco	12.0p	10.0" x 10"	14,670	2003	377

Object		Type	Coord J2000	Const.	Mag.	Size	LYrs	Year	U-1
☐IC4677	Inside NGC6543	PN	17 58 15.3 + 66 38 05	Dra	15.7	1.0' x 0.4'	3,000	2018	30
☐Djorgovski 2	ESO 456-38	GC	18 01 49.1 – 27 49 33	Sgr	9.69	9.9'	20,000	2004	339
☐TC-2: Trifid Neb.	Star Birth	RNeb	18 02 25.0 – 22 59 00	Sgr		41 x 36.3"	4,100	2006	339
☐Barnard 90		Dk Neb	18 10 17.4 – 28 18 00	Sgr	--	3.0' x 2.0'	--	2018	377
☐Palomar 7	IC1276	GC	18 10 44.2 – 07 12 27	Ser	10.3	8.0'	16,000	2004	294
☐Serpen's Object		RNeb	18 29 56.6 + 01 14 51	Ser	14.9	2.1 x 0.5'	750	2006,14	250
☐GJJC 1 (In M22)	PK10-8.1	PN	18 36 22.8 – 23 55 18	Sgr	15.0p	10" x 7"	10,100	2003	340
☐Minkowski 1-6	PK64+15.1	PN	18 50 02.3 + 35 14 33	Lyr	13.3(V)	36.2"	12,000	2000	117
☐M57 – Outer Halo	NGC6720	PN	18 53 35.2 + 33 01 44	Lyr	16+	2.7' x 2.4'	2,350	2003	117
☐Abell 53	PH 40-0.1	PN	19 06 46.1 + 06 23 50	Aql	15.5(V)	31.0"	5,500	2012	206
☐Berkeley 46	NGC6791	O.C.	19 20 53.7 + 37 46 09	Lyr	9.5	10.0'	15,000	2017	118
☐Parsamian 21		ENeb	19 29 00.8 + 09 38 45	Aql	14.07(V)	52 x 20.0"	--	2014	207
☐Abell 70	PK38-25.1	PN	20 31 33.2 – 07 05 18	Aql	14.3p	43.0"	7,800	2000	299
☐Gyul'budagyan's Nebula		RNeb	20 45 58.0 + 67 58 30	Cep	--	1.6 x 0.7'	--	2006	32
☐Cygnus Egg	PK80-6.1	Proto PN	21 02 18.7 + 36 41 40	Cyg	13.5	1.0' X 0.5'	1,370	2001	121

Distances, Radial Velocity Based: $H_o = 70$ km s^{-1} Mpc^{-1} (m = million / Bill = Billion)

BL Lac -	BL Lacerta Object	O.C. -	Open Cluster
D Gal -	Dwarf Galaxy	PN -	Planetary Nebula
Dk Neb-	Dark Nebula	ProtoPN-	Proto Planetary Nebula
ENeb -	Emission Nebula	RNeb -	Reflection Nebula
Gal. -	Galaxy	Sy -	Seyfert
G.C. -	Globular Cluster	SThin -	Super Thin

U 1 = Uranometria, 1st Version

References:

MegaStar 5
Simbad Astronomical Database - CDS (Strasbourg)
NASA / IPAC Extragalactic Database (NED)

2000: "Rings Over TSP" - 2 each
2001: "Explosions Over TSP" - 5 each
2002: "Interactions" - 3 each
2003: "Planetary Nebulae" - 8 each
2004: "Globular Clusters" - 4 each
2005: "Arp Peculiar Galaxies" - 2 each
2006: "Nebulae" - 3 each
2007: "ABCs of Galaxies" - 1 each
2008: "Local Group" - 1 each
2009: "Galaxy Groups" - 2 each
2010: "Superthin Galaxies" - 4 each
2011: "Proximity – Friends of Friends" - 2 each
2012: "Anything Abell" - 5 each
2013: "Illusions" - 1 each
2014: "Seeing Red" - 2 each
2015: "Markarian Galaxies" - 1 each
2016: "The Science of Biurakan" - 2 each
2017: "Open Clusters and Asterisms" - 2 each
2018: "Edward Emerson Barnard" - 2 each

Good Hunting - Clear Skies

LARRY MITCHELL

TSP Advanced Observing Program - 2019

The Texas Star Party - Advanced Observing Program - 2020

The Best of the Rest of the Advanced Observing Programs

This year, 2020, is a continuation of the twentieth year of visual observing of the Texas Star Party Advanced Observing Programs. The Advanced Observing Program was initiated to educate and challenge observers to locate and observe those objects they might have considered too difficult, if not impossible to find and/or see visually, beforehand. There is no better place to push the visual limit than under the dark transparent West Texas sky. Too often observers stop at the *"NGC Limit"* and never try to locate objects that begin with names like *Arakelian, Minkowski, Palomar or Sanduleak*. Such *Name Intimidation* is nothing more than becoming overwhelmed by the seemingly exalted difficulty of the object merely due to its unfamiliar name. A large telescope is NOT required to observe most of these objects.

The listed objects are best located and observed by careful and precise star-hopping. It is most imperative that the observer know ***exactly*** where in the field to look when the object is located, especially if some object turns out to be truly "light challenged" in their particular telescope. By using various magnifications and a combination of averted and direct vision along with a large degree of patience - eventually the object will be seen. Give the sky a chance and it will come to you. The standard observing rule is if you think you see the object at least three times, then you probably Really Did See It - Log it - and go on to the next object. But first please refer to the handout for some information about the object, as each is unique and has a story to tell, and knowing something about what you are looking at makes it a much more interesting discovery.

This year's advanced program highlights some of the brighter and more interesting objects that have been listed over the previous years. This is - by far - the easiest TSP Advanced list ever published, and will provide some "eye-candy" as a reward for those of you who may have experienced "retinal torture" in the past. An advanced observer may be able to visually see ALL of the listed objects using only a modest aperture telescope. In planning your observations, pay attention to both the listed magnitudes and the object size, which will give an indication of the surface brightness of each object. However, as we visual observers know all too well, the only way to know for sure if something is visible, on that particular night and in that specific telescope, is to LOOK for yourself. Adopt the theory, that within reason anything may be seen, until you have visually proven otherwise.

There are 52 deep sky objects on the observing list, and only 20 objects are required to obtain a twenty-year observing pin. Even if some of the objects were previously observed in prior years, they must be observed this year to get a pin. Those of you who have successfully observed all of the previous years, plus this year's objects, will also receive a very special TSP 20 year advanced anniversary T-shirt, while they last. As always, some of this year's objects are very easy, and some may challenge even the best of you, but everybody at this year's star party should be able to receive a TSP Advanced Observing Pin. As astronomers, we are privileged to view massive far-away objects that most people do not know even exists. I urge you to try All of the objects, as you may be surprised at your accomplishments. With patience and good sky conditions this list is certainly well within the range of all observers, beginner or advanced, with small or large telescopes, who desires a

TSP Advanced Observing Pin - From The One and The Only - The TEXAS STAR PARTY.

1. Any telescope may be used or any combination of telescopes.
2. Location by Star Hopping is Preferred - The only way to know where an object is in the heavens is to go and find it. *"Star Hop and be Educated"*. Maybe next time you can locate it without a chart, from memory - Always the Best Way.
3. An Advanced Observing Pin will be awarded to those who observe any 20 of the listed objects during TSP.
4. Observation programs from previous years may be completed for appropriate pins.
5. Observations may be turned in to Larry Mitchell anytime during the Star Party.

To those of you who only complete part of the list, but who have worked hard at it, you have successfully completed the spirit of the program. You have improved your observing skills, learned something about the night sky and hopefully enjoyed yourself.... And you can always get that observing pin next year. Many people have enthusiastically stated how amazed they were at themselves - For locating and observing these objects themselves and with their own equipment.

◄ EXPAND YOUR OBSERVING LIMITS - THIS IS WHAT THE ADVANCED PROGRAM IS ALL ABOUT ►

I hope you enjoy this challenge as much as I have in presenting it and that it gives you a new sense of Enjoyment and Confidence in your Abilities to Successfully View – With Your Own Eyes Natures Grandest Arena - Our Magnificent Universe.

LARRY MITCHELL : **Chairman – TSP Advanced Observing Program – 2020**

The Texas Star Party Advanced Observing Program – 2020
Best of the Rest of the Advanced Observing Programs 20th Year
Observe ANY 20 Objects (In the Year 2020) – Receive a 20 Year Pin

Object		Type	Coord J2000	Const.	Mag.	Size	DLY	Year	U1
☐Double Quasar	0957+561 A/B	Grav Lens	10 01 21.1 +55 53 57	Uma	16.7v	Stellar-2	8.7 Bill	2001	45
☐Sextans A	DDO 75	Gal	10 11 00.5 –04 41 57	Sex	11.5	5.7 x 5.1'	4.73 m	2008	234
☐NGC3190 Cluster	Hickson 44	Gal Clstr	10 18 05.7 +21 49 57	Leo	11.15(V)	4.4' x 1.2'	72.4 m	2007	144
☐ NGC3226/	UGC5617	Gal Pair	10 23 27.0 +19 53 53	Leo	13.33(V)	3.3' x 2.5'	61.6 m	2005	144
NGC3227	Arp 94	Gal Pair	10 23 30.6 +19 51 55		11.79(V)	5.2' x 4.0'	53.3 m		144
☐NGC3395/3396	Arp 270	Gal Pair	10 49 50.1 +32 58 58	LMi	12.1(V)	1.8' x 1.6'	76.1 m	2005	105
NGC3396	UGC5935	Gal Pair	10 49 55.2 +32 59 26		12.5(V)	4.2' x 1.4'	77.6 m		105
☐Shakhbazian 1	LEDA 32808	Gal Clstr	10 55 06.0 +40 27 29	Uma	16.5	17.2 x 15.4'	1.63 Bill	2002	73
☐Mayall's Object	Arp 148	Pol RGal	11 03 53.9 +40 51 00	Uma	15.4p	0.5 x 0.4'	500.0 m	2000	73
☐NGC3690/	Mark 171A	H II Gal	11 28 31.3 +58 33 42	Uma	12.86(V)	1.5' x 1.0'	141.3 m	2015	46
IC694	Mark 171B	H II Gal	11 28 30.6 +58 33 29		12.1	1.1' x 0.9'	145.9 m	2015	46
☐Copelands Septet	Hickson 57	Gal Clstr	11 37 54.0 +21 58 51	Leo	13.6-16.0v	6.2 x 3.3'	425.0 m	2002	147
☐NGC3786/	Mark 744	Sy 1.8 Gal	11 39 42.4 +31 54 33	Uma	13.74(V)	2.2' x 1.2'	124.1 m	2002/	106
NGC3788	UGC6623	Gal	11 39 44.7 +31 55 51		12.50(V)	1.7' x 0.6'	120.6 m	2015	106
☐NGC4151	UGC7166	Sy 1 Gal	12 10 32.5 +39 24 21	CVn	11.48(V))	6.5' x 5.0'	44.5 m	2001	74
☐Hickson 61	The "Box"	Gal Clstr	12 12 18.5 +29 10 47	Com	12.2-17.5v	7.1 x 3.2'	180.0 m	2002	107
☐NGC4183	UGC7222	SThin Gal	12 13 17.2 +43 41 48	CVn	12.9b	6.3' x 0.8'	52.0 m	2010	74
☐NGC4298/	UGC7412	Gal pair	12 21 33.0 +14 36 11	Com	11.3(V)	3.0 x 1.8'	53.1 m	2002	193
NGC4302	UGC7418	LINER	12 21 42.4 + 14 35 39		11.6(V)	5.8 x 0.7'	51.8 m		193
☐NGC4449	UGC7592	Neb/Gal	12 28 11.4 +44 05 40	CVn	9.64(V)	6.1 x 4.3'	12.5 m	2006	75
☐3C 273	B1226+0219	QSO	12 29 06.4 +02 03 09	Vir	13.0	Stellar	2.4 Bill	2001	238
☐NGC4567/	Siamese Twins	Gal pair	12 36 32.8 +11 15 31	Vir	12.1(B)	3.3 x 2.0'	105.7 m	2002	194
NGC4568			12 36 34.2 +11 14 24		11.7(B)	4.8 x 2.0'	103.5 m		194
☐NGC4676 A/B	The "Mice"	Gal pair	12 46 10.6 +30 44 39	Com	13.1-13.8v	1.9 x 1.4'	301.9 m	2002	108
☐Centaurus Clstr	Abell 3526	Gal Group	12 48 49.2 –41 18 40	Cen	11.4	180.0'	150.0 m	2009	402
☐Coma Cluster	Abell 1656	Gal Group	12 59 48.0 +27 58 00	Com	12.0	224.0'	300.0 m	2009	149
☐Hardcastle Gal.	UGCA334	Gal	13 12 55.2 -32 41 16	Cen	13.3p	5.6 x 1.5'	111.0 m	2007	370
☐N5350/53/54	Hickson 68	Gal Clstr	13 53 21.5 +40 21 49	CVn	11.3(V)	3.3 x 2.4	112.4 m	2002	76
☐NGC5426/	Arp 271	Gal Pair	14 03 25.0 –06 04 10	Vir	12.6b	3.0 x 1.6'	130.4 m	2002	286
NGC5427	UGCA 381		14 03 26.1 –06 01 53		11.99B0	3.2 X 2.3'	130.3 m		286
☐Abell 37	PK326+42.1	P.N.	14 04 25.9 –17 13 40	Vir	13.9v	54" x 54"	6,000LY	2012	331
☐NGC5544/	Arp 199	Pol RGal	14 17 02.5 +36 34 17	Boo	14.2	1.0 x 1.0'	141.0 m	2000	110
NGC5545	UGC9143	Gal Pair	14 17 05.5 +36 34 34		16.0	1.3' x 0.5'	144.5 m		110
☐Hoag's Object	A1515+2146	Pol RGal	15 17 14.4 +21 35 08	Ser	15.0b	1.0x 0.9'	593.3 m	2000	154
☐IC4553	Arp 220	Sy 2 Gal	15 34 57.3 +23 30 11	Ser	13.88(V)	1.5 x 1.2'	255.0 m	2001	154
☐Shapley 1	PK 329+2.1	P.N.	15 51 41.2 –51 31 21	Nor	13.98(V)	72.0"	5,000LY	2000	432
☐NGC6027	Seyfert's Sextet	Gal Clstr	15 59 12.5 +20 45 48	Ser	13.5-15.9	2.0 x 1.0'	200.0 m	2002	155
☐Hercules Cluster	Abell 2151	Gal Group	16 05 12.0 +17 44 40	Her	13.5(10th)	56.0'	500 m	2009	155
☐IC4593	PK25+40.1	P.N.	16 11 44.5 +12 04 17	Her	10.84(V)	30.0"	7,500LY	2003	200
☐Abell 39	PK47+42.1	P.N.	16 27 33.8 +27 54 33	Her	13.7p	2.9'	6,850LY	2003	156
☐Terzan 3	ESO390-SC6	G.C.	16 28 40.0 –35 21 13	Sco	12.0	3.0'	27,000LY	2004	375
☐IC4617	LEDA2085077	Sy 2 Gal	16 42 08.1 +36 40 59	Her	15.5	1.2 x 0.4'	550.0 m	2011	114
☐Shakhbazian 16	MCG+9-27-94	Gal Clstr	16 49 08.4 +53 23 33	Dra	14.8	0.3' x 0.2	400.0 m	2007	52
☐NGC6309	"Box" Nebula	P.N.	17 14 04.5 –12 54 41	Oph	11.6(V)	16.0"	6,500LY	2003	292
☐NGC6337	The "Cheerio"	P.N.	17 22 15.6 –38 29 02	Sco	12.0(V)	51.0"	5,200LY	2000	376

Object		Type	Coord J2000	Const.	Mag.	Size	DLY	Year	U1
☐Trumpler 27	Cr 336	O.C. (?)	17 36 12.7 –33 29 10	Sco	6.7	6.0'	8,000LY	2017	376
☐Palomar 6	ESO520-21	G.C.	17 43 42.2 –26 13 21	Oph	11.6	1.2'	24,000LY	2004	338
☐The "Dragon"	M8 - Lagoon	Bok Glob	18 04 45.6 -24 29 56	Sgr	--	180" X 25"	5,475LY	2006	339
☐Barnard 92	LDN 323	Dark Neb	18 15 27.9 –18 13 19	Sgr	--	15.0' x 9.0'	10,000 Y	2018	339
☐T Lyra	18306+3657	CarbonStar	18 32 20.1 +36 59 56	Lyr	--	Stellar	2,500LY	2014	117
☐NGC6645	"Little Circlet"	O.C.	18 32 36.0 –16 53 00	Sgr	8.5(V)	10.0'	3,200LY	2017	295
☐Palomar 8	ESO591-12	G.C.	18 41 29.9 –19 49 33	Sgr	11.2	5.2'	41,700LY	2004	340
☐Berkeley 82		O.C.	19 11 20.0 +13 07 06	Aql	--	2.0'	3,200LY	2017	206
☐NGC6781	PK 41-2.1	P.N.	19 18 28.2 +06 32 15	Aql	11.8p	1.8' x 1.8'	3,100LY	2014	206
☐PC 22	PK 51-4.1	P.N.	19 42 03.6 +13 50 35	Aql	14.4p	24" x 18"	17,200LY	2003	207
☐NGC6818	Little Gem	P.N.	19 43 57.8 –14 09 10	Sgr	9.3(V)	48.0"	5,000LY	2018	297
☐NGC6888	Crescent Neb	Wolf Ray	20 12 01.0 +38 23 00	Cyg	--	18 x 8'	5,000LY	2001/06	119
☐IC4996	MWSC3297	O.C.	20 16 30.0 +37 38 00	Cyg	7.3	5.0'	6,500LY	2017	119
☐Aquarius Dwarf	DDO 210	Gal	20 46 52.0 –12 50 51	Aqr	14.8.(V)	2.2 x 1.1'	3.0 m	2008	299
☐French 1	"Toadstool"	Asterism	21 07 26.4 +16 18 17	Del	--	13.0'	? LY	2017	210

Radial Velocity Based Distances: H_o = 70 km s^{-1} Mpc^{-1}

TSP ADVANCED OBSERVING PROGRAMS

2000: "Rings Over TSP"
2001: "Explosions Over TSP"
2002: "Interactions"
2003: "G.D. Planetaries"
2004: "Globular Clusters"
2005: "Arp Peculiar Galaxies"
2006: "Nebulae"
2007: "ABCs of Galaxies"33
2008: "Local Group"
2009: "Galaxy Groups"
2010: "Superthin Galaxies"
2011: "Proximity – Friends of Friends"
2012: "Anything Abell"
2013: "Illusions"
2014: "Seeing Red"
2015: "Markarian Galaxies"
2016: "The Science of Byurakan"
2017: "Open Clusters and Asterisms"
2018: "Edward Emerson Barnard, The Man, Science & Times"
2019: "Best of the TSP Obscure Universe, 20th Year – No. 1"
2020: "Best of the Rest-The TSP Advanced Programs, 20 Years"– No. II

LY – Light Year
DLY – Distance in Light Years
B – Billion
m – Million
Bok Glob – Bok Globule
Dark Neb – Dark Nebula
Gal – Galaxy
Gal Clstr – Galaxy Cluster
G.C. – Globular Cluster
Grav Lens – Gravitational Lens
Neb/Gal – Nebula in Galaxy
O.C.– Open Cluster
Pol RGal – Polar Ring Galaxy
P.N. – Planetary Nebula
QSO – Quasar
Ring Gal – Ring Galaxy
SThin Gal – Super Thin Galaxy
Sy – Seyfert
Wolf Ray – Wolf Rayet

LARRY MITCHELL

TSP Advanced Observing Program - 2020

The Best of the Rest of the TSP Advanced Observing Programs, 20th Year - Part II

The Texas Star Party - Advanced Observing Program - 2021

The Best of the Rest of the Advanced Observing Programs

This year, 2021 gets us back under the stars at night, but the star party functions are conducted virtually as the in-person gathering at the Prude Ranch has been cancelled due to Covid-19. This year's Advanced Observing Program will be conducted from an observing site of your choosing - Details will follow below. The observing program is a continuation of the twentieth year of the advanced visual observing programs of the Texas Star Party. Normally I would not present one, and certainly not two "Best-of" programs as they only cover ground previously trodden, but two years ago I got talked into it and everybody seemed to enjoy the variety of targets presented. Therefore, for this year's abbreviated star party I am going with the *Best of the Rest, of the Advanced Observing programs*, or as some would say, *The Best of the Advanced Observing Programs - Part II.* This year highlighted are 40 of some of the brighter and more interesting objects that have been listed over the previous years. This is - by far - the EASIEST Advanced TSP list ever published, and will provide some "eye-candy" as a reward for those of you who may have experienced "retinal torture" in the past. With just a little extra effort and a good sky, an advanced observer may be able to visually see ALL of the objects using only a modest aperture telescope. In planning your observations, pay attention to both the listed magnitudes and the object size, which will give an indication of the surface brightness of each object. Also try to observe the target when it is high up in the sky, as close to its transit point as possible. As we visual observers know all too well, the only way to know for sure if something is visible, on that particular night and with those specific optics, is to LOOK for YOURSELF. Adopt the theory, that within reason anything may be seen, until you have visually proven otherwise, which may require more than one night of trying. Remember, everything requires effort - the only thing you can achieve without it is failure.

The Advanced Observing Program was initiated to educate and challenge observers to locate and observe those objects they might have considered too difficult, if not impossible to find and/or see visually. Too often observers stop at the *"Messier Limit"* or the *"NGC Limit"* and never try to locate objects that begin with names like *Arakelian, Minkowski, Palomar or Sanduleak*. The listed objects are best located and observed by careful and precise star-hopping. It is most imperative that the observer know ***exactly*** where in the field to look once the field is located, especially if some item turns out to be truly "light challenging". By using various magnifications and a combination of averted and direct vision along with a large helping of patience - eventually the object will be seen. Give the sky a chance and it will come to you. The standard observing rule is if you think you see the object at least three-times, then you probably Really Did See It, so log it and proceed onward.

Only 20 objects out of the 40 listed are required to obtain a twenty-year observing pin, but I would encourage everybody to try and observe the entire list as there are some real visual gems present. To get a TSP Advanced Observing Pin all objects must be observed during End of Twilight June 5 – Dawn June 13, 2021 your local time and your location. I also have a good supply of special Advanced Observer T-shirts which are reserved for the 'Best-of-the Best', those of you who have received a pin for every year of the program's existence, which of course includes this year. These will be handed out at next year's TSP (2022) with supporting documentation.

Requirements:

1. Any telescope may be used or any combination of telescopes, from any observing location of your choosing.
2. An Advanced Observing Pin will be awarded to the first 95 who observe any 20 of the 40 objects.
3. Observations are limited to End of Twilight June 5 – Dawn June 13, 2021 your local time and your location.
4. Every successful observer will also receive an Advanced Observer Certificate.
5. Location by **Star Hopping** is Preferred but Not Mandatory. The only way to know where an object truly is located is to go and find it. "*Star Hop and be Educated*". Maybe you can then locate it without a chart, from memory – Always Best.
6. Submitted Observing Logs must Contain:
    A. The physical location of the Observation.
    B. Date and Time of the Observation.
    C. The aperture of the telescope (s) used for the observation.
    D. A general indication of sky conditions – Seeing (Excellent – Poor) and Transparency (1 – 6 Best).
    E. The observers primary mailing address for mailing observing pins and certificates.
7. Submit Advanced Observing Logs to Steve and Amelia Goldberg at advanced-challenge@TexasStarParty.org
8. Larry Mitchell will approve all observations and mail observing pins.
9. Certificates will be provided by either download link and/or attached to a confirmation email.

The Texas Star Party Advanced Observing Program – 2021
The Best of the Rest of the Advanced Observing Programs - 20th Year

Observe ANY 20 of the 40 Objects During End of Twilight June 5 – Dawn June 13, 2021 your local time and your location
The First 95 Successful Observers will Receive a 20 Year Pin

Object		Type	Coord J2000	Const	Mag.	Size	Dist LY	TSP Year	Observer Date/Time
☐Double Quasar	0957+561 A/B	Grav Lens	10 01 21.1 +55 53 57	Uma	16.7(V)	Stellar-	8.7 Bill	2001	/
☐Sextans A	DDO 75	Gal	10 11 00.5 –04 41 57	Sex	11.5	5.7 x 5.1'	4.73 m	2008	/
☐NGC3190 Cluster	Hickson 44	Gal Clstr	10 18 05.7 +21 49 57	Leo	11.15(V)	4.4' x 1.2'	72.4 m	2007	/
☐ NGC3226/	UGC5617	Gal Pair	10 23 27.0 +19 53 53	Leo	13.33(V)	3.3' x 2.5'	61.6 m	2005	/
NGC3227	Arp 94	Gal Pair	10 23 30.6 +19 51 55	Leo	11.79(V)	5.2' x 4.0'	53.3 m	2005	/
☐NGC3690/	Mark 171A	H II Gal	11 28 31.3 +58 33 42	Uma	12.86(V)	1.5' x 1.0'	141.3 m	2015	/
IC694	Mark 171B	H II Gal	11 28 30.6 +58 33 29	Uma	12.1	1.1' x 0.9'	145.9 m	2015	/
☐Copelands Septet	Hickson 57	Gal Clstr	11 37 54.0 +21 58 51	Leo	13.6-16.0(V)	6.2 x 3.3'	425.0 m	2002	/
☐NGC3786/	Mark 744	Sy 1.8 Gal	11 39 42.4 +31 54 33	Uma	13.74(V)	2.2' x 1.2'	124.1 m	2002	/
NGC3788	UGC6623	Gal	11 39 44.7 +31 55 51	Uma	12.50(V)	1.7' x 0.6'	120.6 m	2015	/
☐NGC4151	UGC7166	Sy 1 Gal	12 10 32.5 +39 24 21	CVn	11.48(V))	6.5' x 5.0'	44.5 m	2001	/
☐Hickson 61	The "Box"	Gal Clstr	12 12 18.5 +29 10 47	Com	12.2-17.5(V)	7.1 x 3.2'	180.0 m	2002	/
☐NGC4183	UGC7222	SThin Gal	12 13 17.2 +43 41 48	CVn	12.9b	6.3' x 0.8'	52.0 m	2010	/
☐NGC4298/	UGC7412	Gal pair	12 21 33.0 +14 36 11	Com	11.3(V)	3.0 x 1.8'	53.1 m	2002	/
NGC4302	UGC7418	LINER	12 21 42.4 + 14 35 39	Com	11.6(V)	5.8 x 0.7'	51.8 m	2002	/
☐NGC4449	UGC7592	Neb/Gal	12 28 11.4 +44 05 40	CVn	9.64(V)	6.1 x 4.3'	12.5 m	2006	/
☐3C 273	B1226+0219	QSO	12 29 06.4 +02 03 09	Vir	13.0	Stellar	2.4 Bill	2001	/
☐NGC4567/	Siamese Twins	Gal pair	12 36 32.8 +11 15 31	Vir	12.1(B)	3.3 x 2.0'	105.7 m	2002	/
NGC4568	VCC 1676		12 36 34.2 +11 14 24	Vir	11.7(B)	4.8 x 2.0'	103.5 m	2002	/
☐NGC4676 A/B	The "Mice"	Gal pair	12 46 10.6 +30 44 39	Com	13.1-13.8(V)	1.9 x 1.4'	301.9 m	2002	/
☐Centaurus Clstr	Abell 3526	Gal Group	12 48 49.2 –41 18 40	Cen	11.4	180.0'	150.0 m	2009	/
☐Coma Cluster	Abell 1656	Gal Group	12 59 48.0 +27 58 00	Com	12.0	224.0'	300.0 m	2009	/
☐N5350/53/54	Hickson 68	Gal Clstr	13 53 21.5 +40 21 49	CVn	11.3(V)	3.3 x 2.4	112.4 m	2002	/
☐NGC5426/	Arp 271	Gal Pair	14 03 25.0 –06 04 10	Vir	12.6b	3.0 x 1.6'	130.4 m	2002	/
NGC5427	UGCA 381		14 03 26.1 –06 01 53	Vir	11.99B0	3.2 X 2.3'	130.3 m	2002	/
☐Abell 37	PK326+42.1	P.N.	14 04 25.9 –17 13 40	Vir	13.9v	54" x 54"	6,000LY	2012	/
☐Arp 220	IC4553	Sy 2 Gal	15 34 57.3 +23 30 11	Ser	13.88(V)	1.5 x 1.2'	255.0 m	2001	/
☐Seyfert's Sextet	NGC6027	Gal Clstr	15 59 12.5 +20 45 48	Ser	13.5-15.9	2.0 x 1.0'	200.0 m	2002	/
☐Hercules Cluster	Abell 2151	Gal Group	16 05 12.0 +17 44 40	Her	13.5(10th)	56.0'	500 m	2009	/
☐IC4593	PK25+40.1	P.N.	16 11 44.5 +12 04 17	Her	10.84(V)	30.0"	7,500LY	2003	/
☐Terzan 3	ESO390-SC6	G.C.	16 28 40.0 –35 21 13	Sco	12.0	3.0'	27,000LY	2004	/
☐IC4617	LEDA2085077	Sy 2 Gal	16 42 08.1 +36 40 59	Her	15.5	1.2 x 0.4'	550.0 m	2011	/
☐NGC6309	"Box" Nebula	P.N.	17 14 04.5 –12 54 41	Oph	11.6(V)	16.0"	6,500LY	2003	/
☐NGC6337	The "Cheerio"	P.N.	17 22 15.6 –38 29 02	Sco	12.0(V)	51.0"	5,200LY	2000	/
☐The "Dragon"	M8 - Lagoon	Bok Glob	18 04 45.6 -24 29 56	Sgr	--	180" X 25"	5,475LY	2006	/
☐Barnard 90	LDN108	Dark Neb	18 10 17.4 -28 18 00	Sgr	14.5	3.0' x 2.0'		2018	/
☐T Lyrae	18306+3657	CarbonStar	18 32 20.1 +36 59 56	Lyr	--	Stellar	2,500LY	2014	/
☐NGC6645	"Little Circlet"	O.C.	18 32 36.0 –16 53 00	Sgr	8.5(V)	10.0'	3,200LY	2017	/
☐Palomar 8	ESO591-12	G.C.	18 41 29.9 –19 49 33	Sgr	11.2 5.2'		41,700LY	2004	/
☐Berkeley 82		O.C.	19 11 20.0 +13 07 06	Aql	--	2.0'	3,200LY	2017	/
☐NGC6781	PK 41-2.1	P.N.	19 18 28.2 +06 32 15	Aql	11.8p	1.8' x 1.8'	3,100LY	2014	/
☐PC 22	PK 51-4.1	P.N.	19 42 03.6 +13 50 35	Aql	14.4p	24" x 18"	17,200LY	2003	/
☐NGC6818	Little Gem	P.N.	19 43 57.8 –14 09 10	Sgr	9.3(V)	48.0"	5,000LY	2018	/
☐NGC6888	Crescent Neb	Wolf Ray	20 12 01.0 +38 23 00	Cyg	--	18' x 8'	5,000LY	2001/06	/
☐IC4996	MWSC3297	O.C.	20 16 30.0 +37 38 00	Cyg	7.3	5.0'	6,500LY	2017	/
☐French 1	"Toadstool"	Asterism	21 07 26.4 +16 18 17	Del	--	13.0'	Varies	2017	/

TSP ADVANCED OBSERVING PROGRAMS

2000: "Rings Over TSP"
2001: "Explosions Over TSP"
2002: "Interactions"
2003: "G.D. Planetaries"
2004: "Globular Clusters"
2005: "Arp Peculiar Galaxies"
2006: "Nebulae"
2007: "ABCs of Galaxies"
2008: "Local Group"
2009: "Galaxy Groups"
2010: "Superthin Galaxies"
2011: "Proximity – Friends of Friends"
2012: "Anything Abell"
2013: "Illusions"
2014: "Seeing Red"
2015: "Markarian Galaxies"
2016: "The Science of Byurakan"
2017: "Open Clusters and Asterisms"
2018: "Edward Emerson Barnard, The Man, Science & Times"
2019: "Best of the TSP Obscure Universe, 20th Year" – 1
2021: "Best of the Rest-The TSP Advanced Programs, 20 Years"– II

Bill – Billion
Bok Glob – Bok Globule
Dark Neb – Dark Nebula
DistLY – Distance in Light Years
Gal – Galaxy
Gal Clstr – Galaxy Cluster
G.C. – Globular Cluster
Grav Lens – Gravitational Lens
LY – Light Year
m – Million
Neb/Gal – Nebula in Galaxy
O.C.– Open Cluster
P.N. – Planetary Nebula
QSO – Quasar
Ring Gal – Ring Galaxy
SThin Gal – Super Thin Galaxy
Sy – Seyfert
Wolf Ray – Wolf Rayet

Distances are Based Upon Radial Velocities: $H_o = 70$ km s^{-1} Mpc^{-1}
Observing List and All Textual Material - Unless Specified Otherwise.

As astronomers, we are very privileged to get to view far-away, massive fascinating objects that most people do not know even exists. With patience and good sky conditions this relatively easy list is certainly well within the range of all observers, beginner or advanced, with small or large telescopes.

I hope you enjoy this challenge as much as I have in presenting it and that it gives you a new sense of Enjoyment and Confidence in your Abilities to Successfully View Natures Grandest Arena Our Magnificent Universe – With Your Own Eyes.

A Special Thank-You to Steve and Amelia Goldberg.

Good Luck and Clear Skies,

Larry Mitchell

Chairman – TSP Advanced Observing Program – 2021
The Best of the Rest of the TSP Advanced Observing Programs, 20th Year - Part II

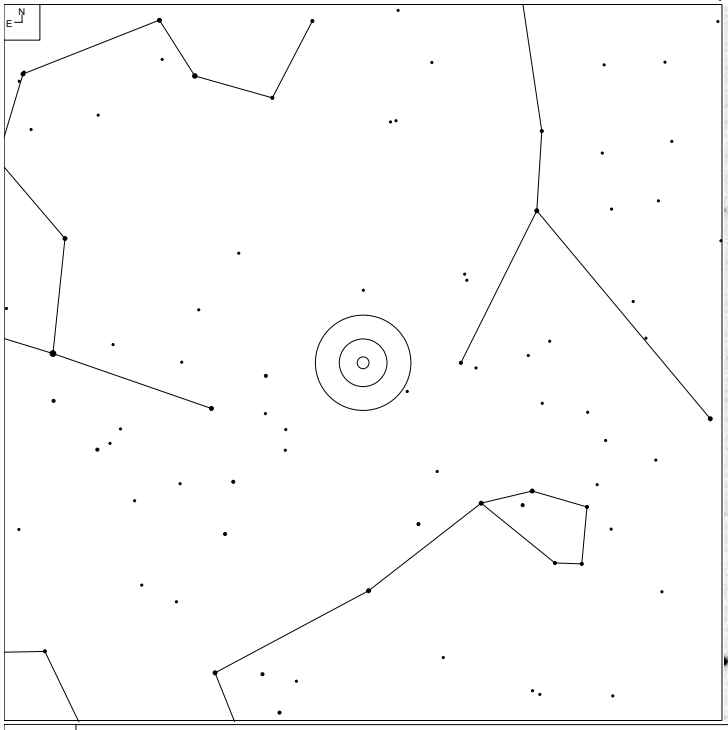
T.S.P. Advanced Observing Program - 2022
Index Catalog Objects

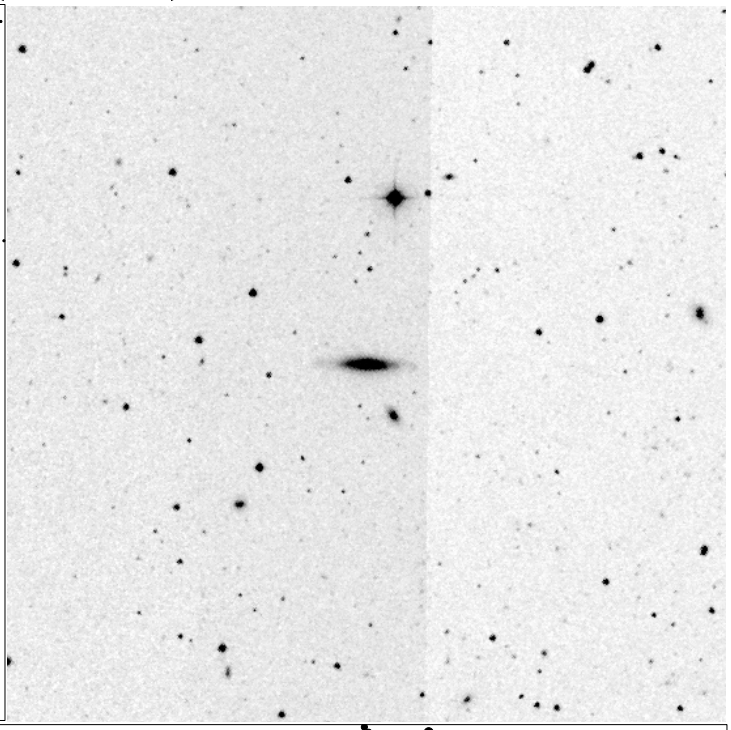
Index No.	Alternate	J2000		Type	Const.	Mag.	Size	Dist.	Class
☐530	MCG 2-24-3	09 15 17.0	+11 53 08	Gal	Cnc	14.1	1.9′ x 0.3′	229.0	SAab
☐529	MCG 12-9-35	09 18 32.8	+73 45 34	Gal	Cam	12.6V	3.2′ x 1.2′	104.9	SA(s)c
☐2469	MCG -5-22-8	09 23 01.0	-32 26 59	Gal	Pyx	12.1	5.8' x 1.2'	76.9	SB(rs)ab
☐2513 (2514)	MCG -5-23-19	09 50 00.8	-32 52 58	Gal	Ant	13.4V	3.4' x 0.7'	131.7	SA(s)ab: sp
☐2522-	MCG -5-24-4	09 55 09.0	-33 08 14	Gal	Ant	13.1	2.3' x 1.7'	140.4	SB(s)c pec
2523	MCG -5-24-5	09 55 09.5	-33 12 37	Gal	Ant	13.6	1.5' x 0.9'	123	SB(s)bc pec
☐2526	MCG -5-24-8	09 57 03.0	-32 15 25	Gal	Ant	13.8B	2.1' x 0.7'	125	SAB)s)0/S0
☐2531	MCG -5-24-15	09 59 55.6	-29 37 03	Gal	Ant	12.9B	6.6′ x 0.6′	114.4	Sc: p
☐2537	MCG -4-24-15	10 03 51.9	-27 34 15	Gal	Ant	12.8V	2.6 x 1.7′	129.6	SAB(rs)c
☐2560	MCG -5-25-1	10 16 18.7	-33 33 50	Gal	Ant	12.7	3.4′ x 1.9′	136.1	(R)SB(r)b
☐708	Papillon Gal.	11 33 59.2	+49 03 43	Gal	UMa	14.1V	1.1′ x 1.1′	434.7	E
☐2969	MCG -1-30-40	11 52 31.3	-03 52 20	Gal	Vir	13.7V	1.2′ x 0.7′	70.1	SB(r)bc
☐2974	MCG -1-30-45	11 53 48.7	-05 10 04	Gal	Vir	13.9V	2.4′ x 0.4′	263.2	SA(s)c / Sc
☐749-	MCG+7-25-8	11 58 34.0	+42 44 03	Gal	UMa	12.9B	2.3′ x 1.8′	35.7	SAB(rs)cd
750	MCG 7-25-10	11 58 52.2	+42 43 21	Gal	UMa	12.8	2.6′ x 1.1′	32.6	Sab:sp Sy2
☐2995	MCG -5-29-8	12 05 47.0	-27 56 24	Gal	Hya	13.2V	3.2′ x 0.9′	85.1	SB(s)c
☐3152	MCG -4-29-18	12 19 36.0	-26 08 44	Gal	Hya	13.5	1.7′ x 1.4′	153.9	SA0 / E-S0
☐3253	MCG -6-27-21	12 23 45.2	-34 37 20	Gal	Cen	11.6V	2.8′ x 1.1′	125.6	Sc
☐3290	MCG -6-27-24	12 25 09.0	-39 46 32	Gal	Cen	12.0V	1.6′ x 1.3′	153.8	S0-a
☐3370	MCG -6-27-29	12 27 37.3	-39 20 16	Gal	Cen	12.2V	2.9′ x 2.3′	135.8	E2 – E3
☐3392	MCG 3-32-49	12 28 43.3	+14 59 58	Gal	Com	12.5V	2.3′ x 1.0′	78.2	SAb
☐3568	Lemon Slice	12 33 06.9	+82 33 50	PNe	Cam	11.6	20.0″	3,260LYrs	II+IIa
☐3831	MCG -2-33-27	12 51 18.6	-14 34 25	Gal	Crv	13.6B	1.4′ x 0.8′	178.8	SAB(s)0
☐3986	MCG -5-31-16	13 01 32.1	-32 17 28	Gal	Cen	13.35B	1.9′ x 1.4′	214.8	E / SAB0
☐844	MCG -5-31-24	13 03 18.2	-30 31 16	Gal	Cen	13.7	1.6′ x 1.1′	136.2	S0 sp
☐4214	MCG -5-31-43	13 17 42.7	-32 06 06	Gal	Cen	12.3	2.8′ x 1.5′	108.0	SB(r)ab
☐879 (IC4222)	MCG -4-31-52	13 19 40.6	-27 25 44	Gal	Hya	14.2	1.3′ x 1.1′	94.7	SB(s)ab pec
☐4296	MCG -6-30-16	13 36 39.0	-33 57 57	Gal	Cen	11.6	3.4′ x 3.2′	174.8	E
☐4329-	MCG -5-33-19	13 49 05.3	-30 17 45	Gal	Cen	12.2B	3.5′ x 2.2′	209.8	SAB(s)0
4329A	MCG -5-33-21	13 49 19.3	-30 18 34	Gal	Cen	13.0V	2.6′ x 0.5′	224.0	S0-a
☐4351	MCG -5-33-34	13 57 54.3	-29 18 57	Gal	Hya	12.61B	6.8′ x 0.9′	123.0	SA(s)b: sp
☐997	MCG -1-37-1	14 19 59.2	-04 27 04	Gal	Vir	14.3	1.4′ x 0.9′	323.0	S / Sc
☐1023	ESO 385-39	14 32 25.0	-35 48 12	O.C	Cen	10.4	4.8′ x 3.1′	??	O.C./Rem?
☐1055(IC4491)	MCG -2-38-11	14 47 25.7	-13 42 58	Gal	Lib	12.6V	2.0′ x 0.6′	135.8	Sb
☐1066-	MCG 1-38-9	14 53 02.9	+03 17 46	Gal	Vir	13.2V	1.4′ x 0.8′	73.4	Sbc
1067	MCG 1-38-10	14 53 05.2	+03 19 54	Gal	Vir	12.2V	2.2′ x 1.7′	72.3	SB(s)b
☐1101	UGC9752	15 10 56.1	+05 44 41	Gal	Vir	14.7V	1.2′ x 0.6′	1.04 Gyr	E-S0 ?
☐4567	MCG 7-32-40	15 37 13.3	+43 17 54	Gal	Boo	12.8	1.4′ X 0.9′	267.0	Sc / SASBcd
☐4599	He 2-155	16 19 23.2	-42 15 37	PNe	Sco	12.3	15.0″	8,300LYrs	?
☐4637	He 2-193	17 05 10.5	-40 53 08	PNe	Scp	12.5V	31.0″	5,700LYrs	III
☐4663	He 2-273	17 45 28.6	-44 54 18	PNe	Sco	12.5V	16.0″x 19.5″	10,000LYrs	IV
☐1297	He 2-431	19 17 23.4	-39 36 46	PNe	CrA	10.89V	22.0″	14,000LYrs	?
☐1311	Collinder 414	20 10 47.3	+41 10 37	O.C.	Cyg	9.9	9.0′ x 9.0′	19,000LYrs	I 1 r n
☐1369	Collinder 432	21 12 07.9	+47 46 12	O.C.	Cyg	9.4	4.0′ x 4.0′	10,700LYrs	II 2 m

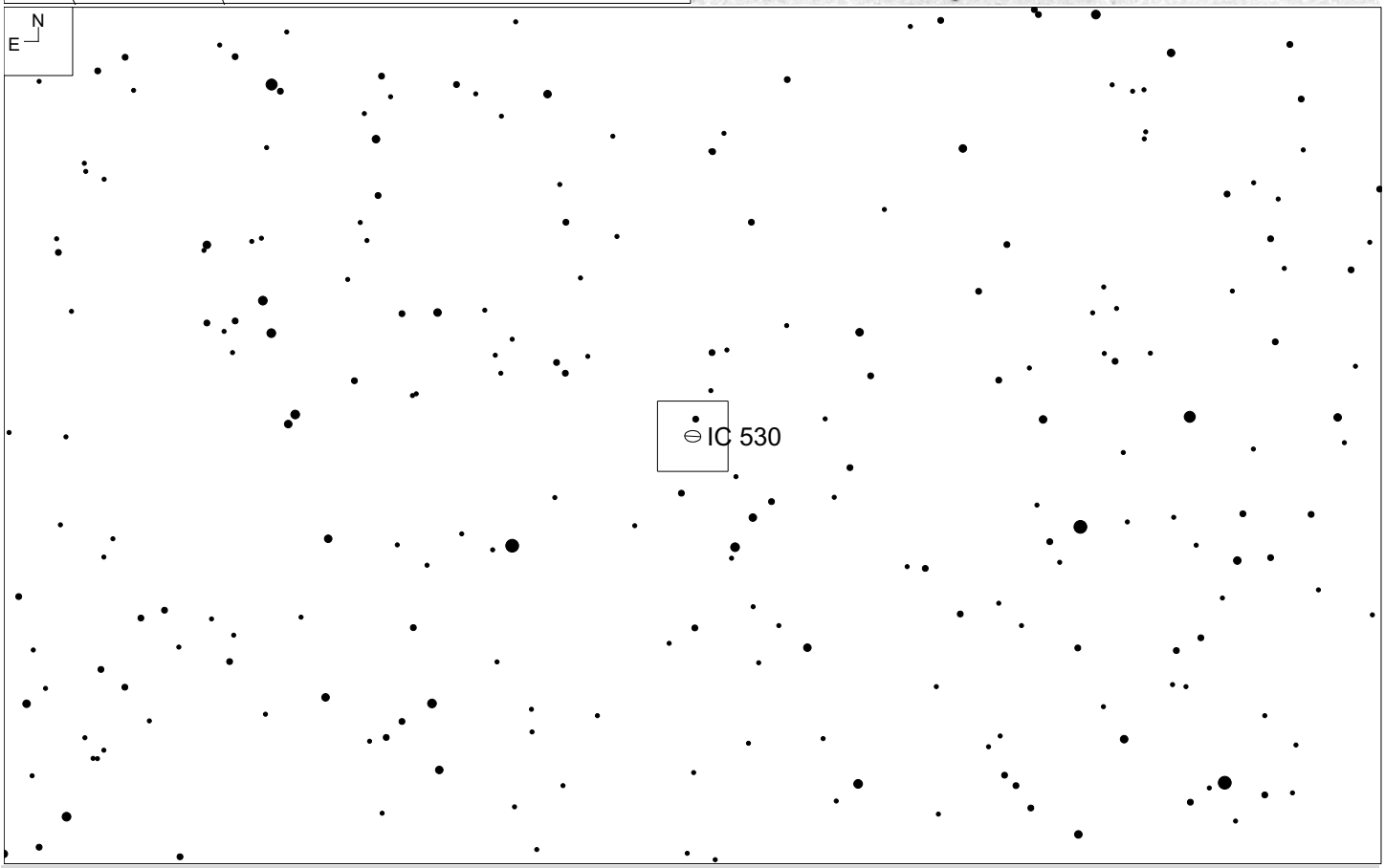
Radial Velocity Distances: Millions of light years unless otherwise specified - Based upon H_o = 70 km.sec^{-1}. Mpc

Larry Mitchell

IC 530 (Cancer)

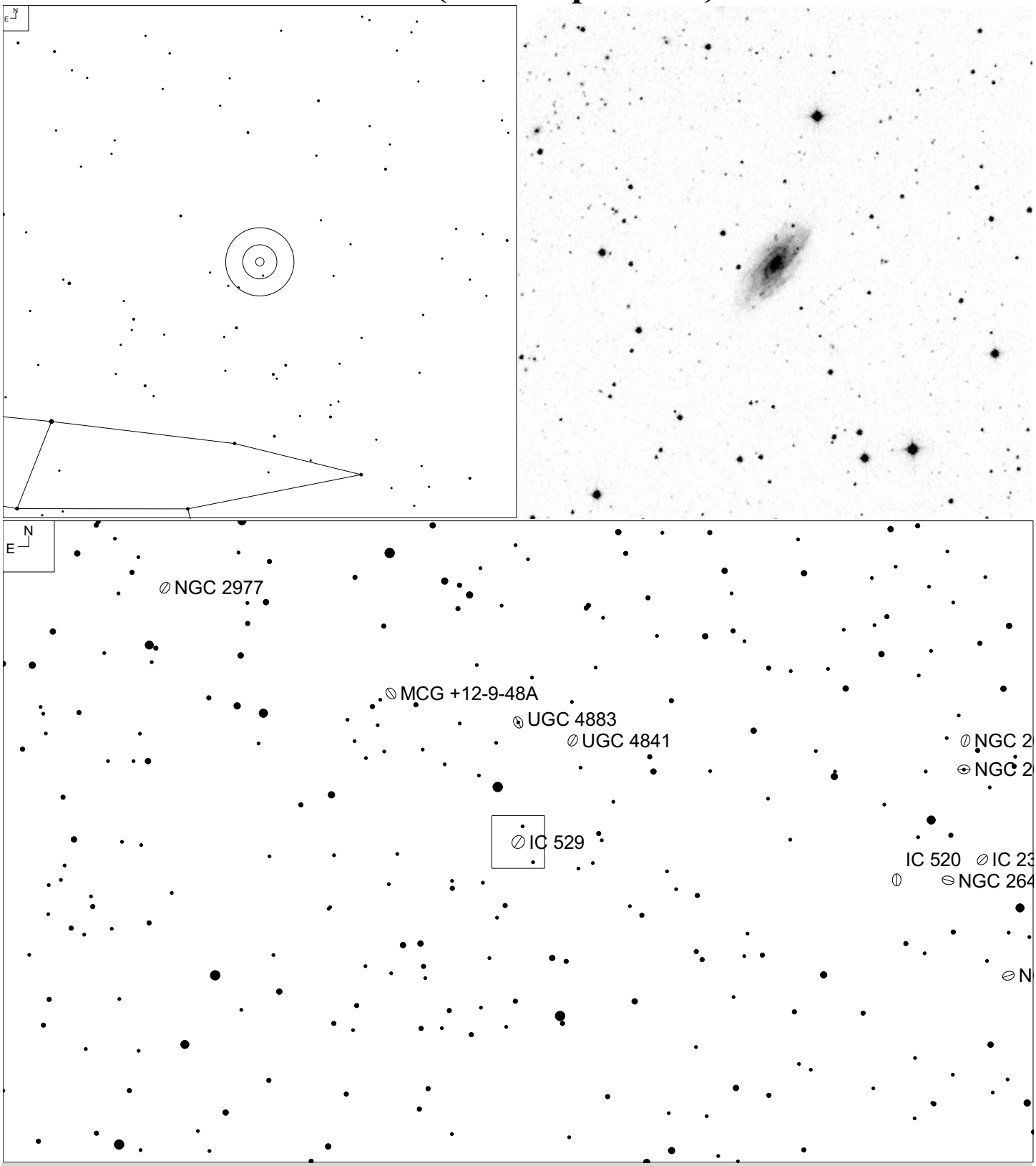






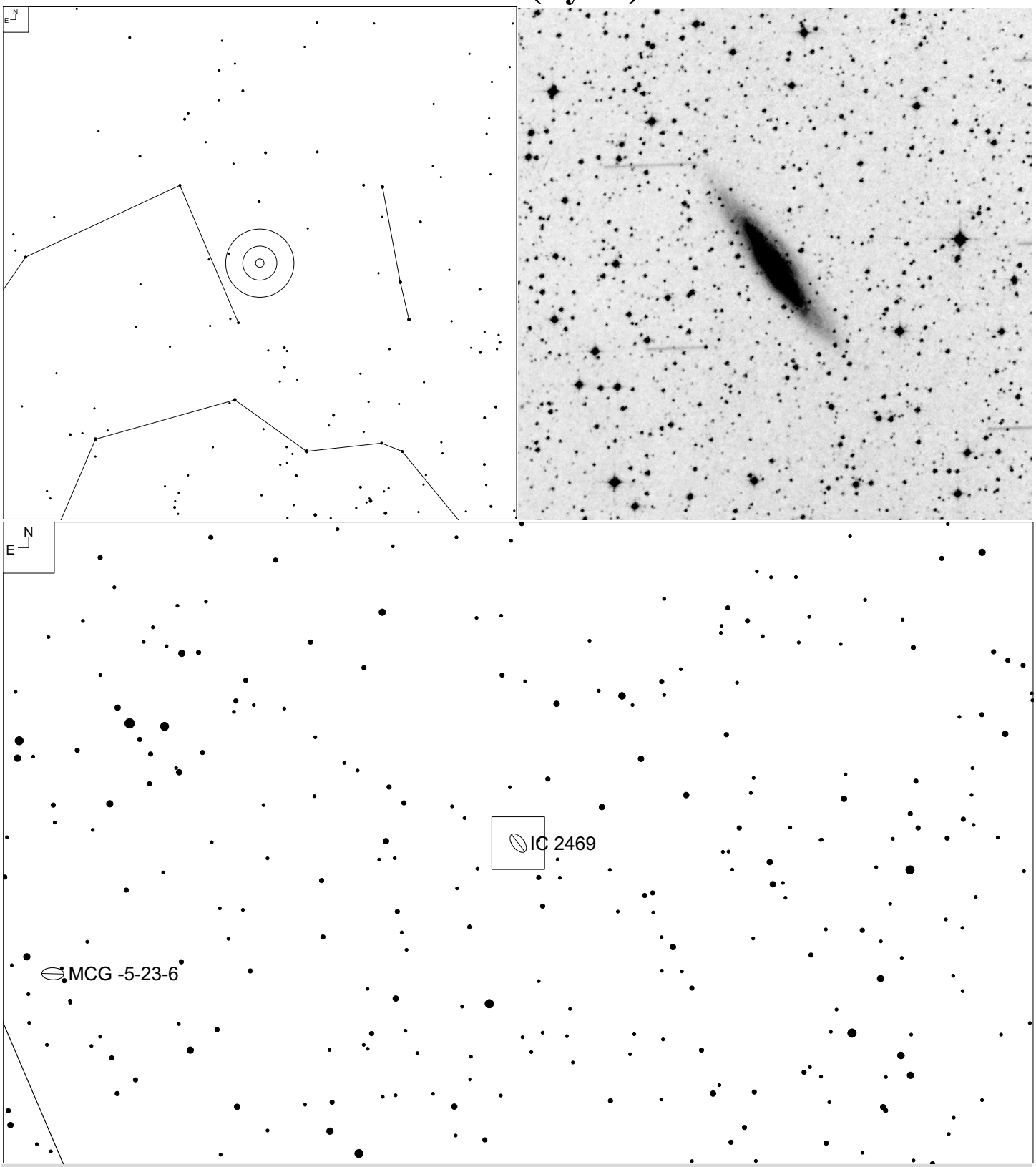
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG+2-27-3	09 15 17.0	+11 53 08	14.1’	1.9’ x 0.3	SAab	93	47

IC 529 (Camelopardalis)



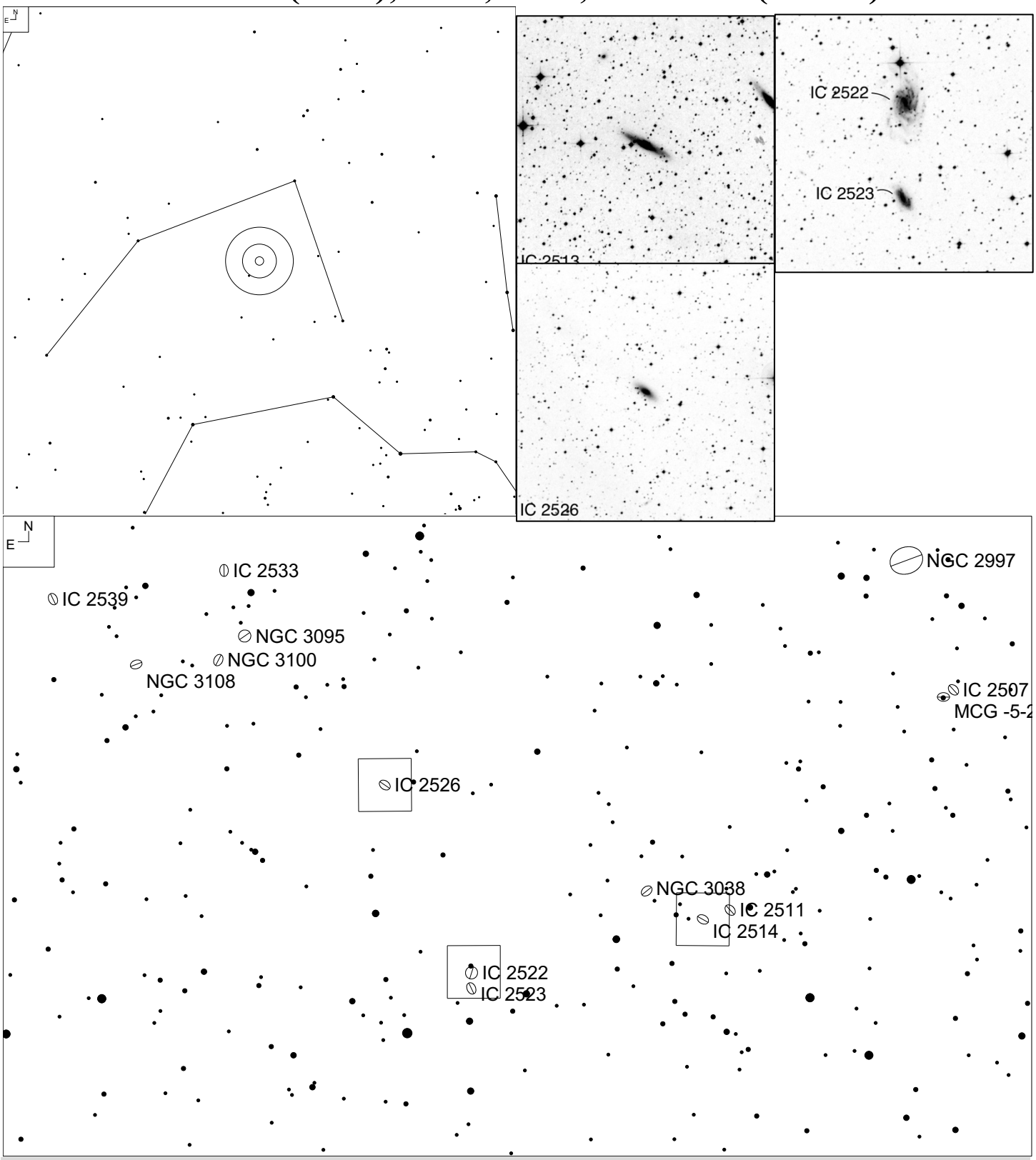
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG 12-9-35	09 18 32.8	+73 45 34	12.6V	3.2’ x 1.2’	SA(s)c	14	5

IC 2469 (Pyxis)



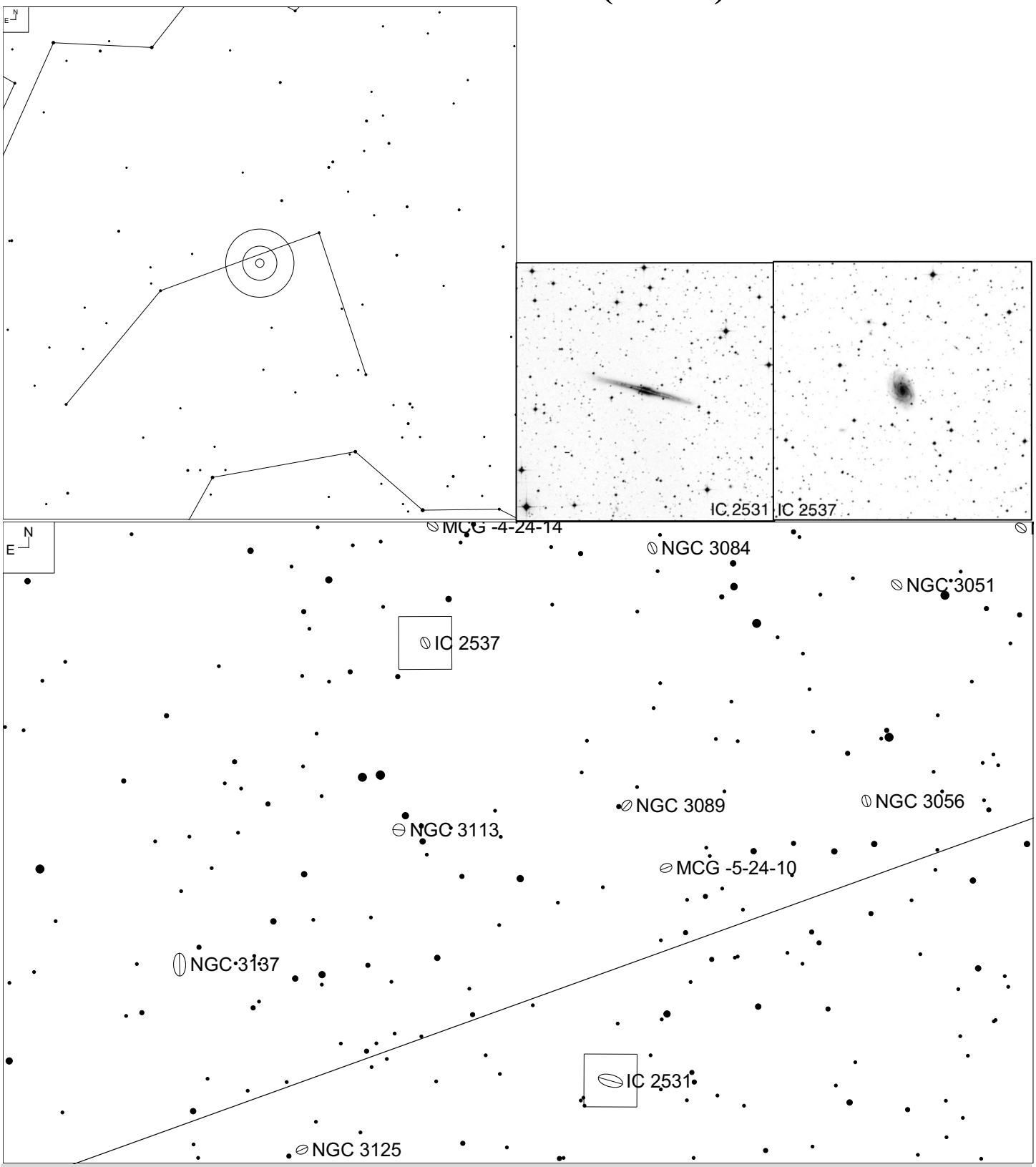
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG -5-22-8	09 23 01.0	-32 26 59	12.1	5.8' x 1.2'	SB(rs)ab	170	83

IC 2513 (2514), 2522, 2523, and 2526 (Antlia)



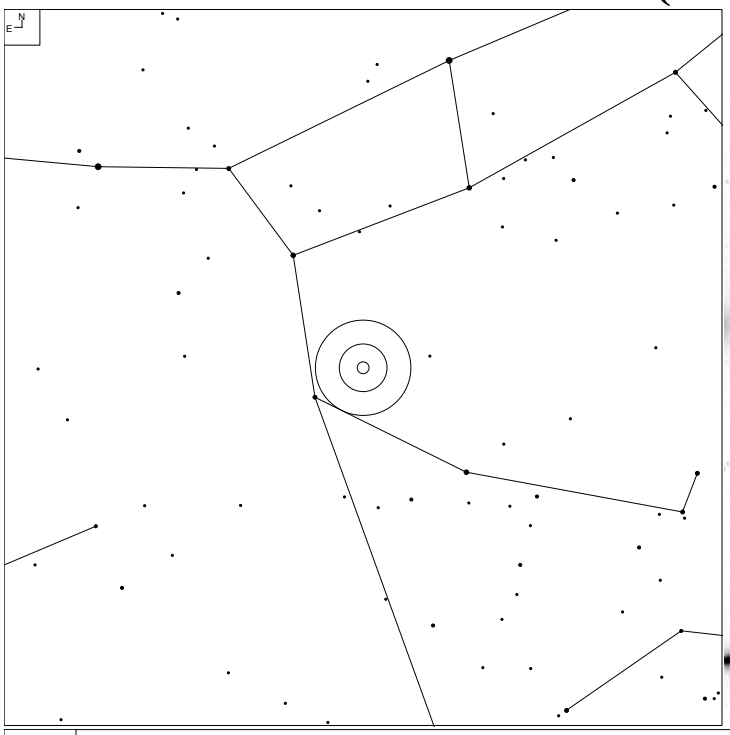
IC	Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
2513	MCG -5-23-19	09 50 00.8	-32 52 58	13.4v	3.4 x 0.7'	SA(s)ab: sp	170	83
2522	MCG -5-24-4	09 55 09.0	-33 08 14	13.1	2.3' x 1.7'	SB(s)c pec		
2523	MCG -5-24-5	09 55 09.5	-33 12 37	13.6	1.5' x 0.9'	SB(s)bc pec		
2526	MCG -5-24-8	09 57 03.0	-32 15 25	13.8B	2.1' x 0.7'	SAB)s)0/S0		

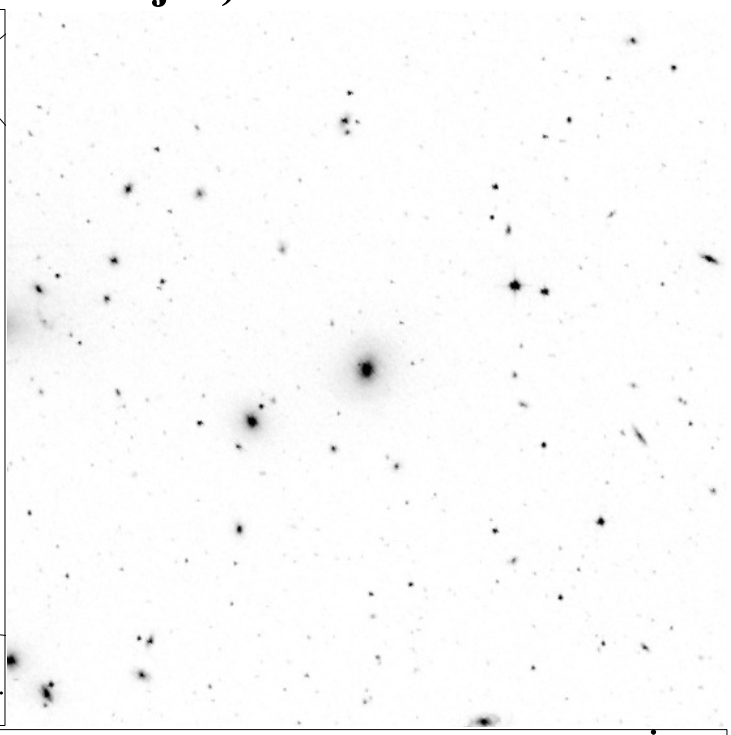
IC 2531 and 2537 (Antlia)

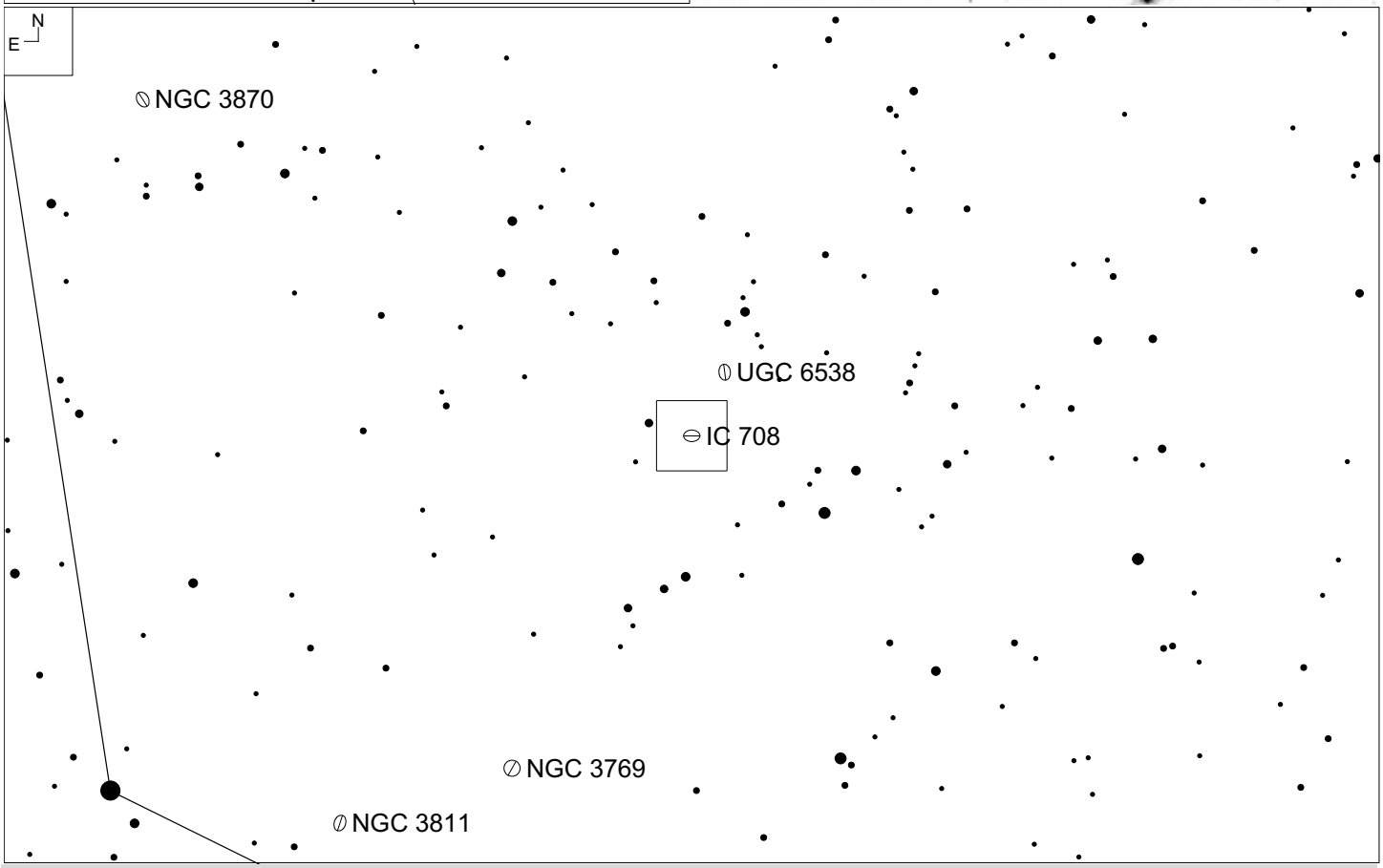


IC	Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
2531	MCG -5-24-15	09 59 55.6	-29 37 03	12.9B	6.6’ x 0.6’	Sc: p	170	82
2537	MCG -4-24-15	10 03 51.9	-27 34 15	12.8V	2.6 x 1.7’	SAB(rs)c		

IC 708 (Ursa Major)

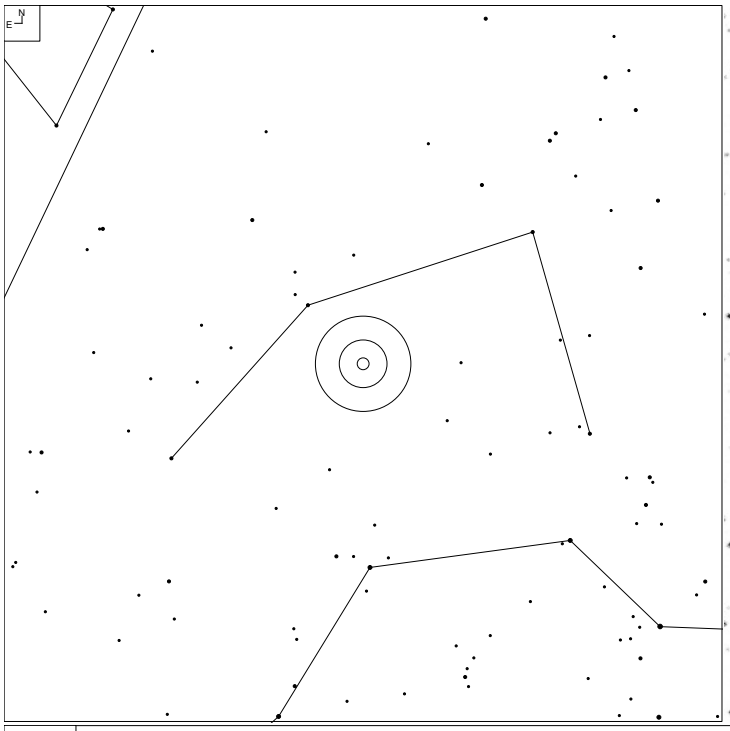


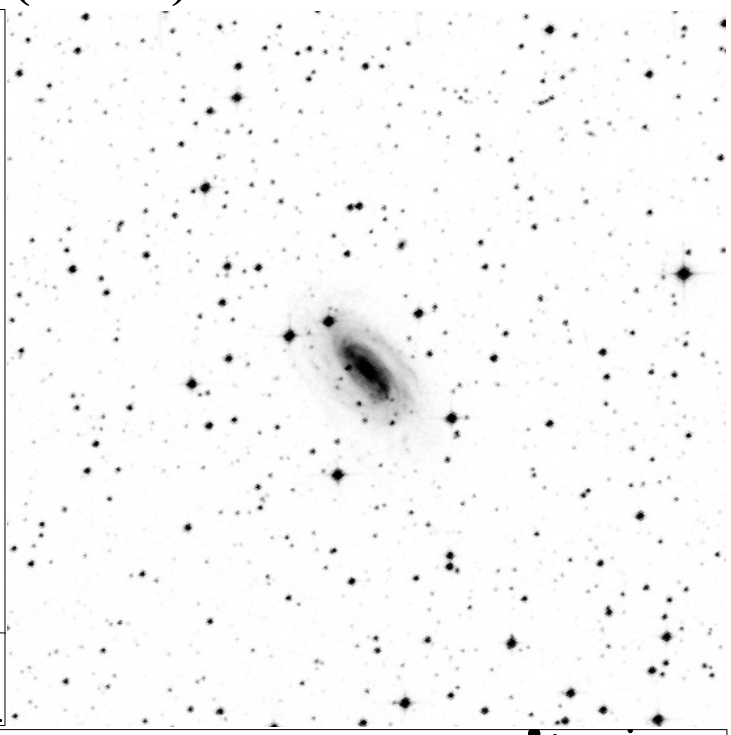


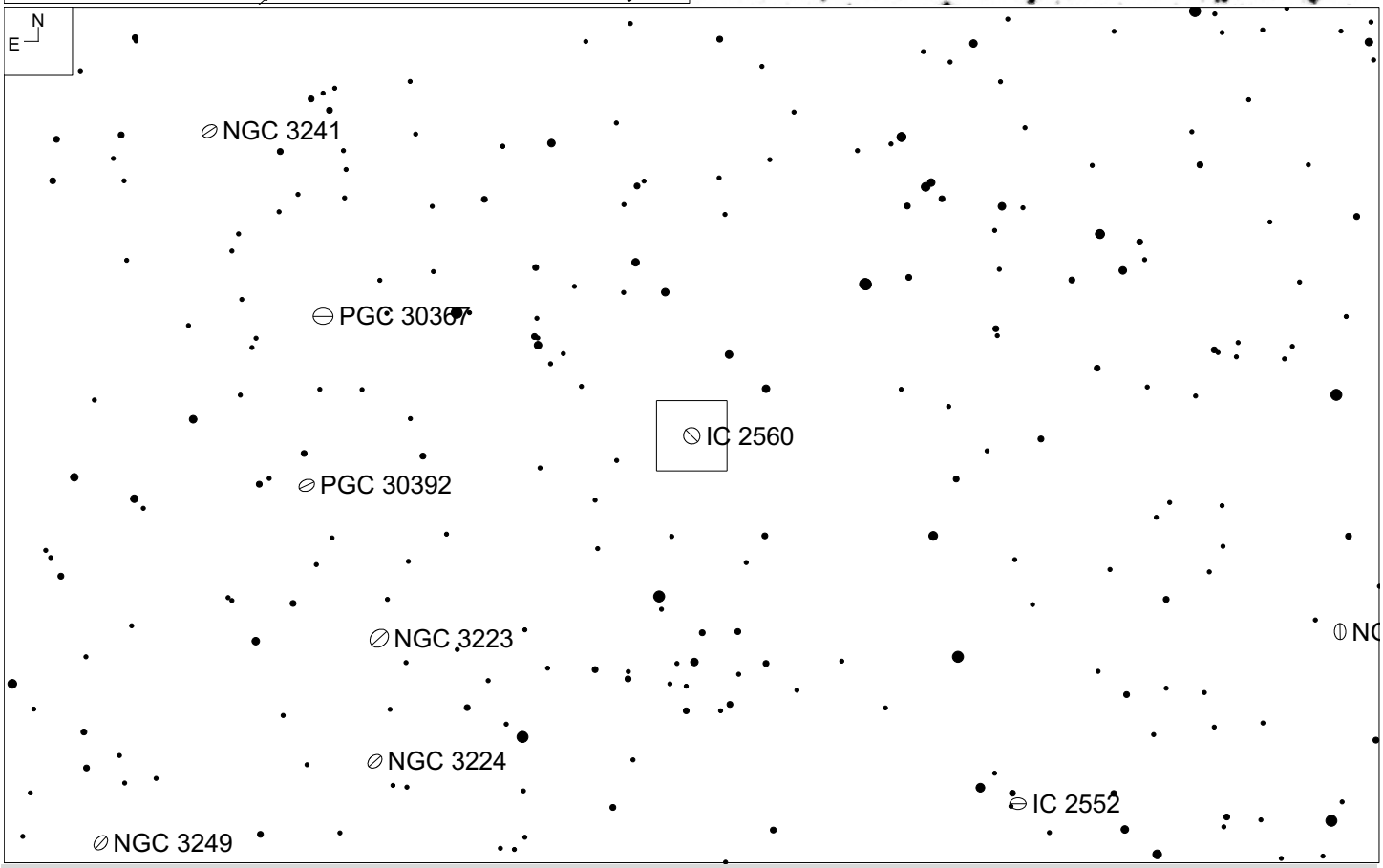


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Papillon Gal	11 33 59.2	+49 03 43	14.1V	1.1’ x 1.1’	E	38	22

IC 2560 (Antlia)

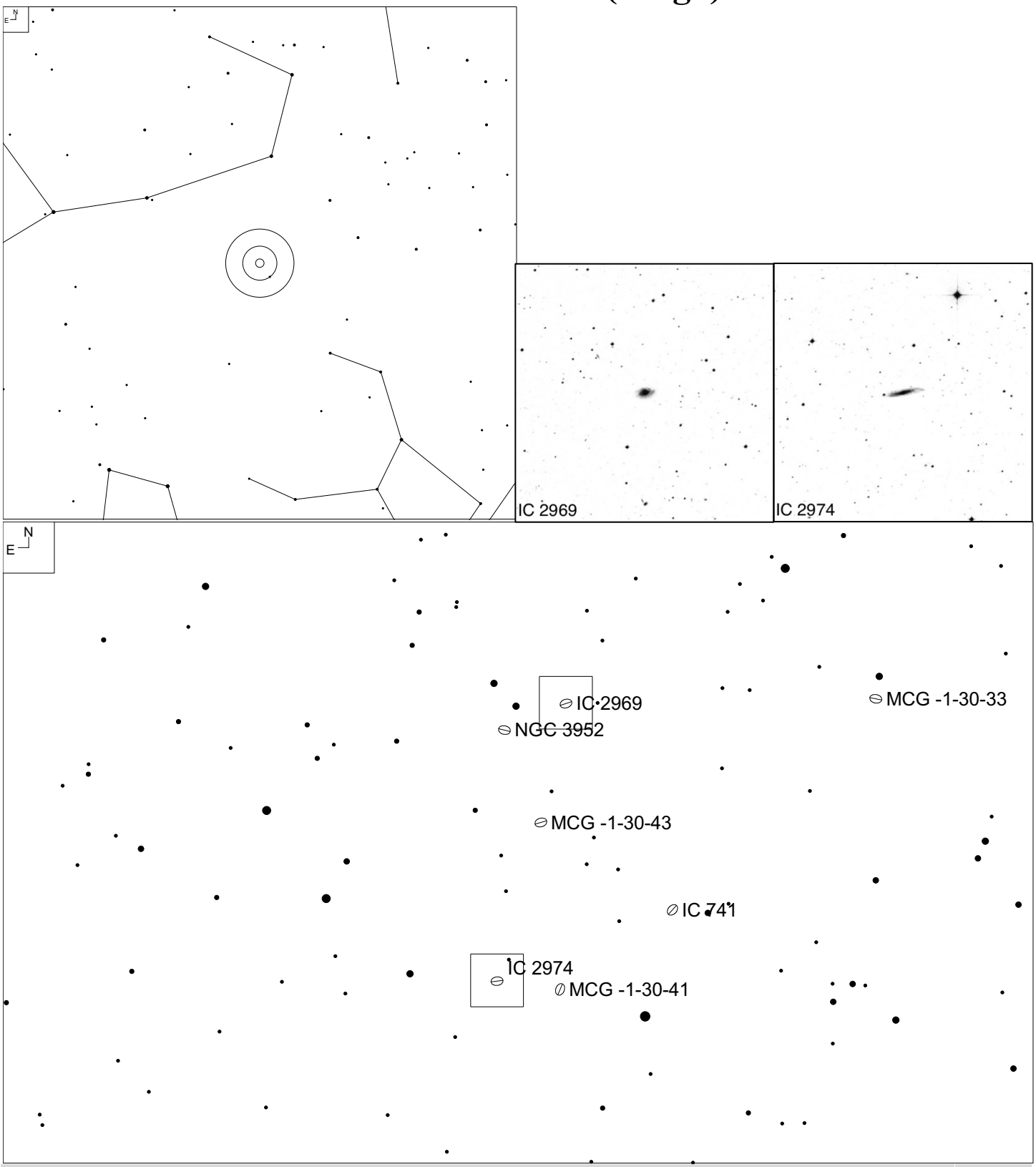






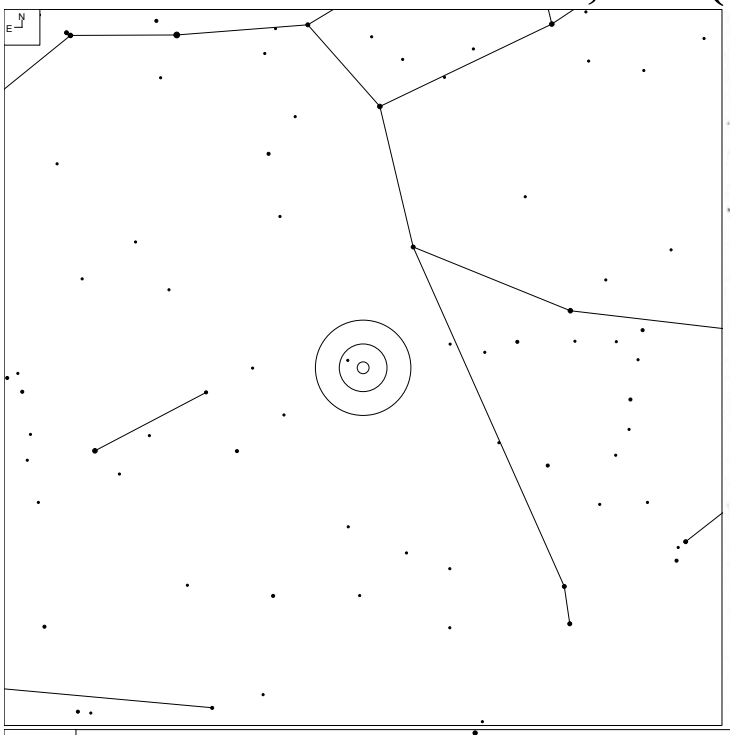
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG -5-25-1	10 16 18.7	-33 33 50	12.7	3.4’ x 1.9’	(R)SB(r)b	169	82

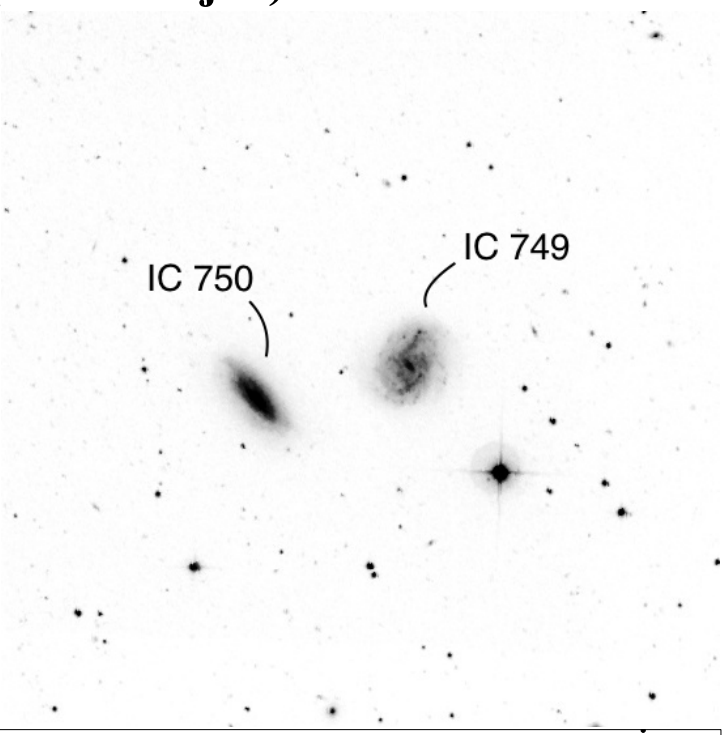
IC 2969 and 2974 (Virgo)

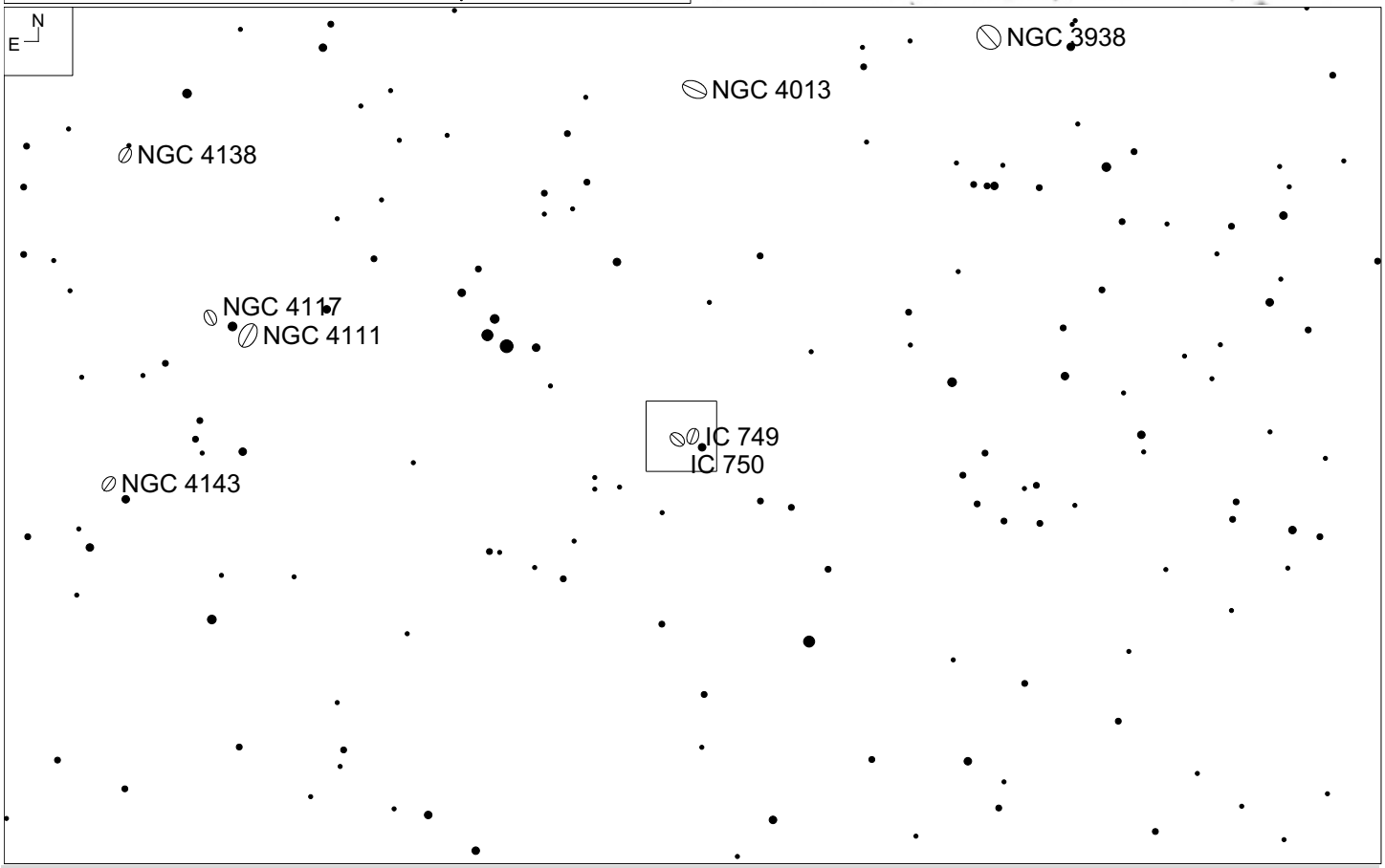


IC	Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
2969	MCG -1-30-40	11 52 31.3	-03 52 20	13.7V	1.2’ x 0.7’	SB(r)bc	111	58
2974	MCG -1-30-45	11 53 48.7	-05 10 04	13.9V	2.4’ x 0.4’	SA(s)c / Sc		

IC 749, 750 (Ursa Major)

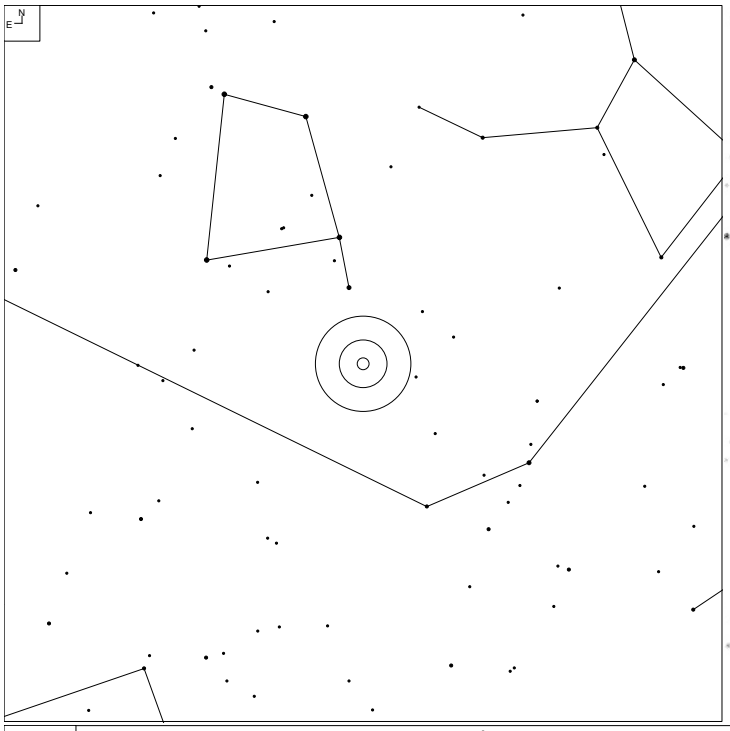


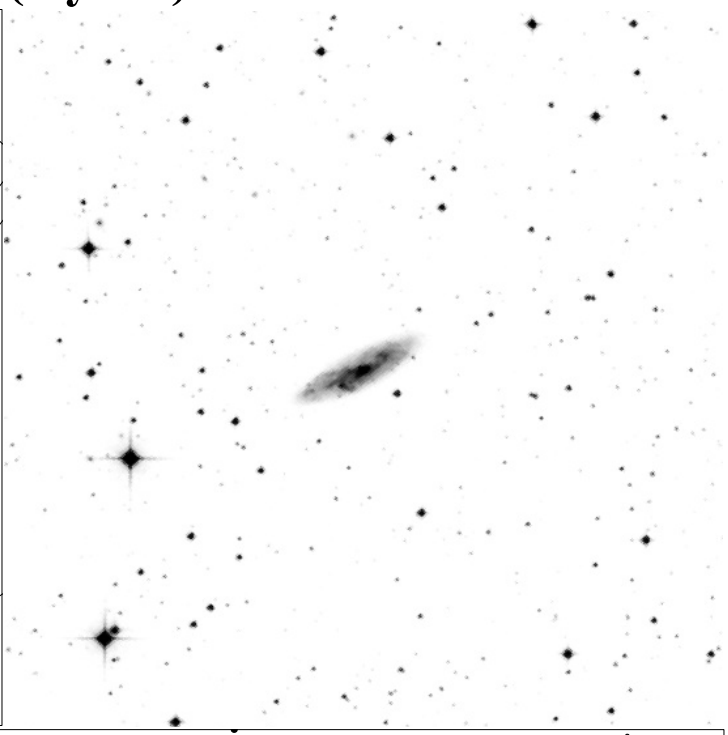


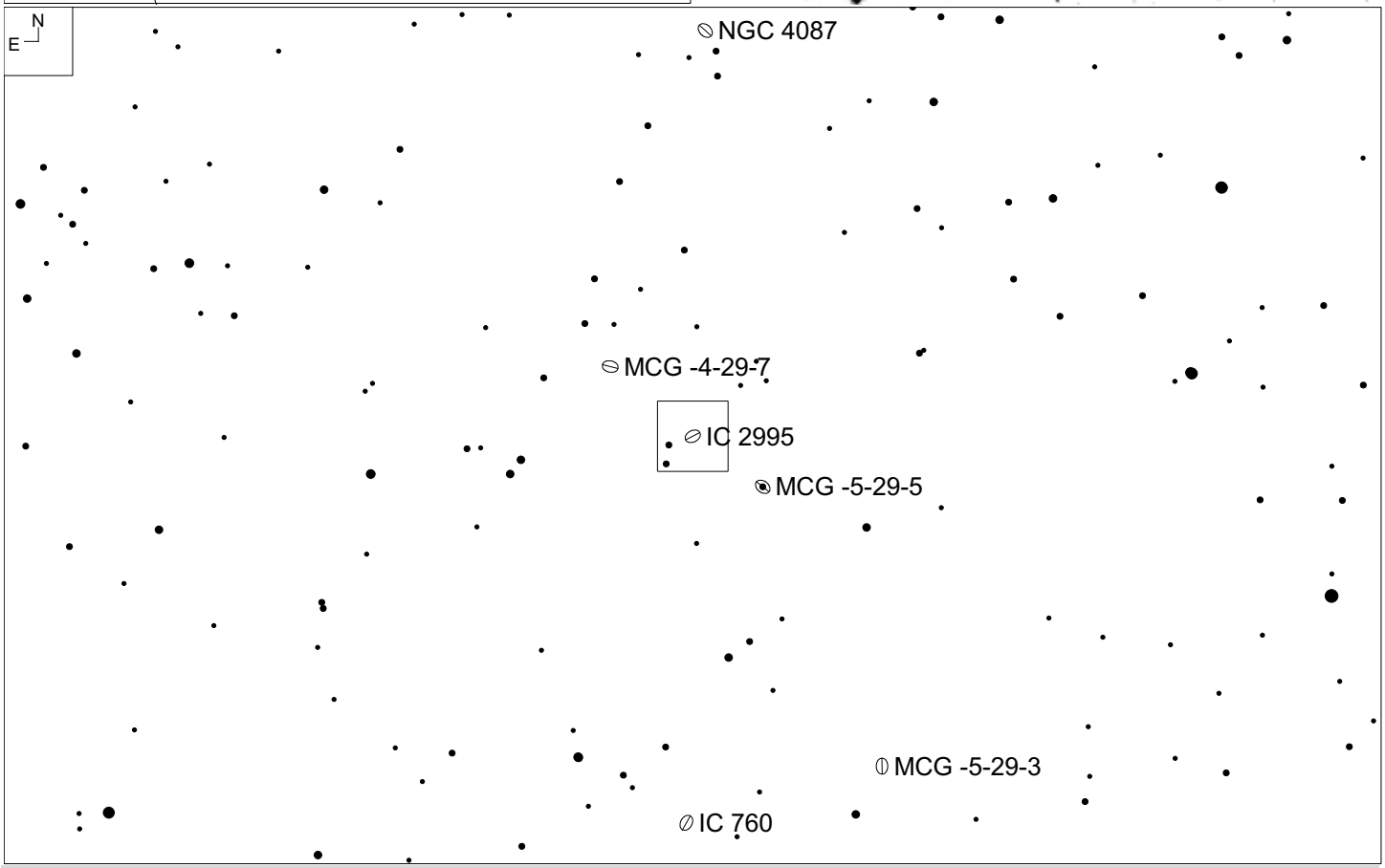


IC	Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
749	MCG+7-25-8	11 58 34.0	+42 44 03	12.9B	2.3’ x 1.8’	SAB(rs)cd	38	22
750	MCG 7-25-10	11 58 52.2	+42 43 21	12.8	2.6’ x 1.1’	Sab:sp Sy2		

IC 2995 (Hydra)

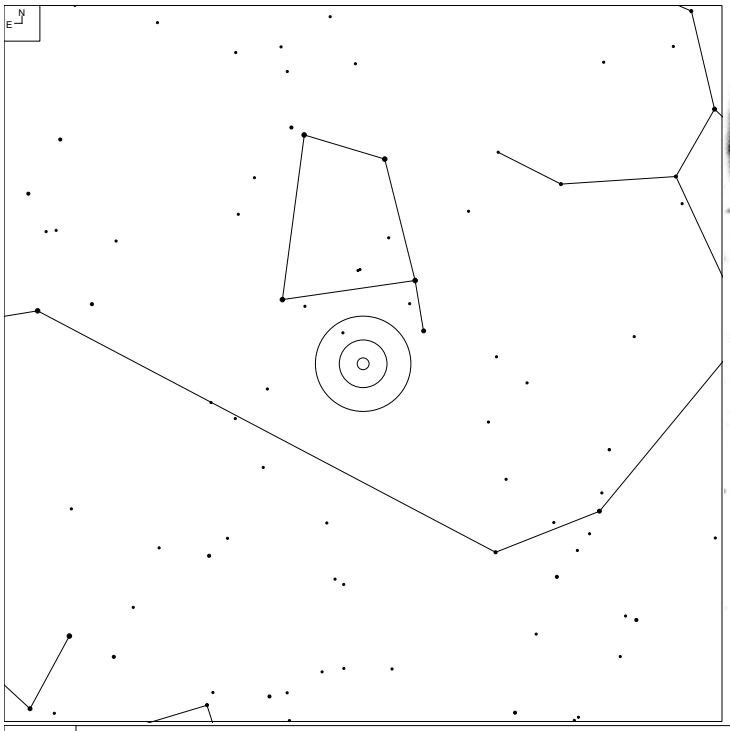


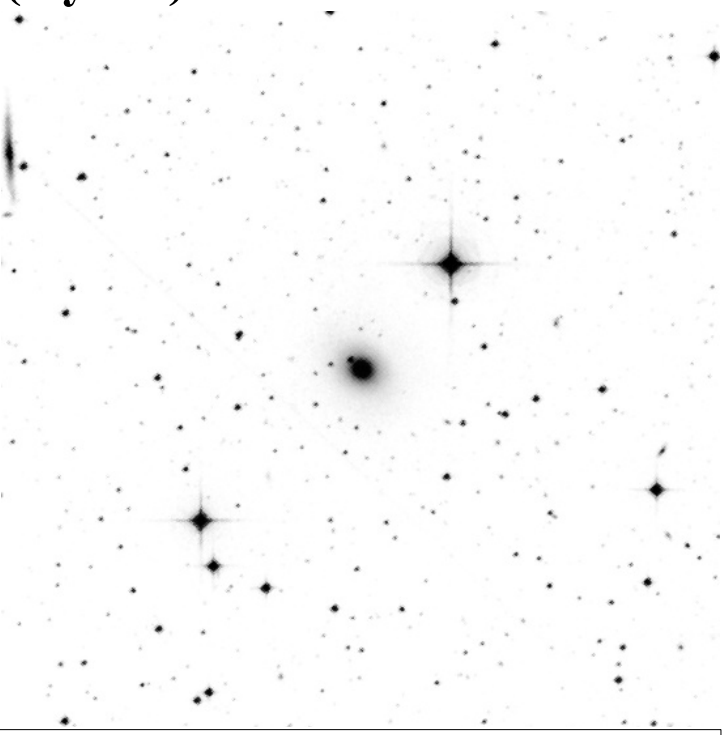


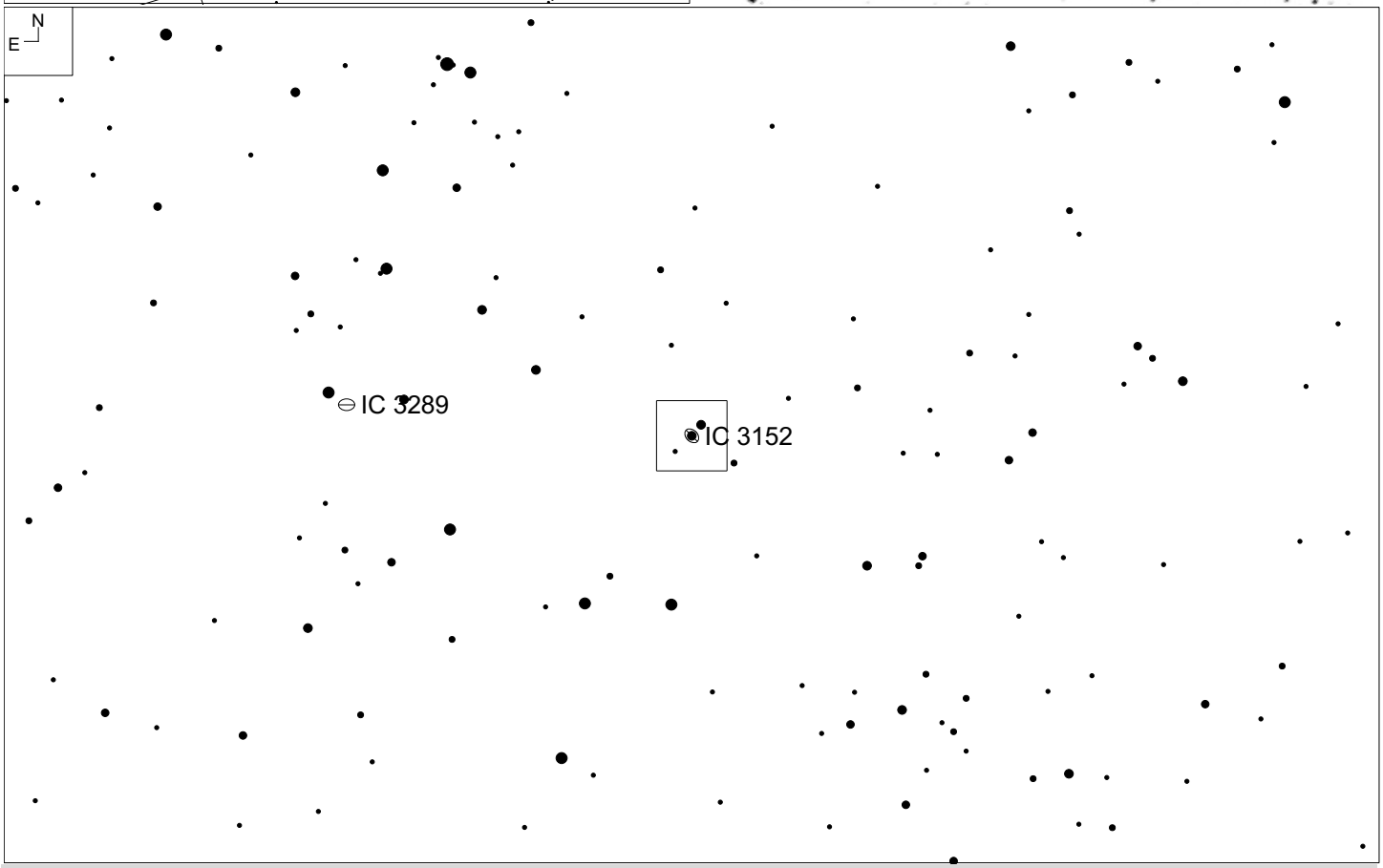


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG -5-29-8	12 05 47.0	-27 56 24	13.2V	3.2’ x 0.9’	SB(s)c	150	81

IC 3152 (Hydra)

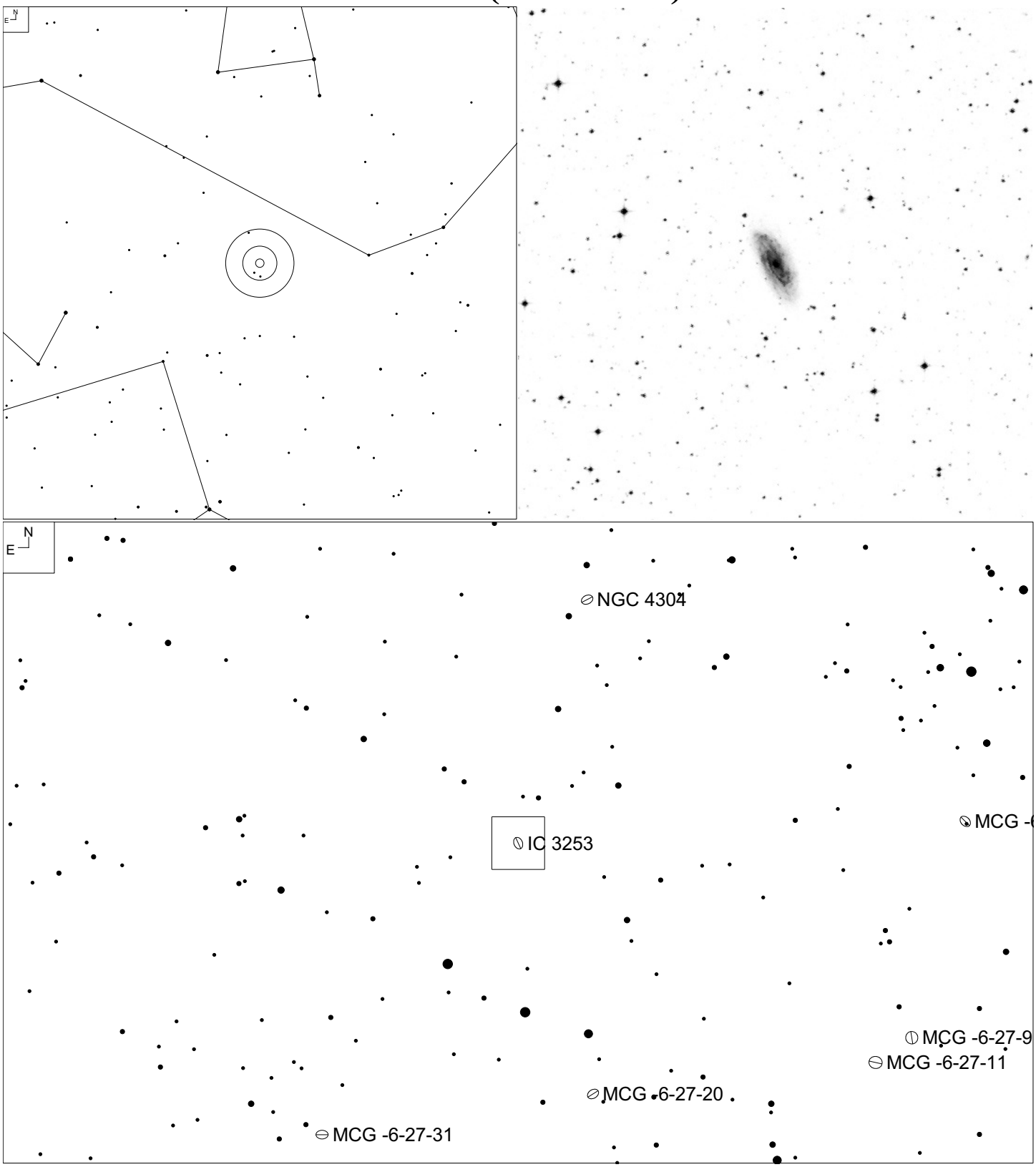






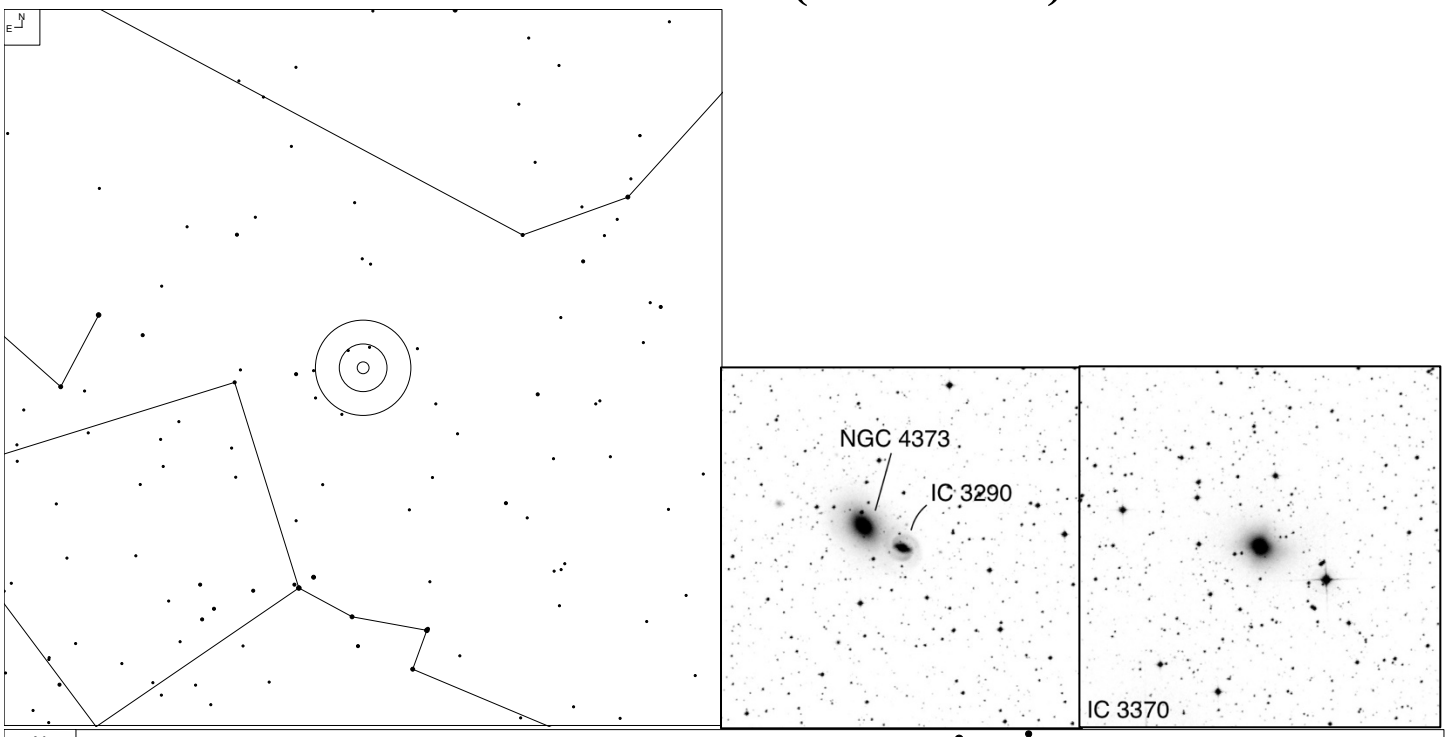
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG -4-29-18	12 19 36.0	-26 08 44	13.5	1.7’ x 1.4’	SA0 / E-S0	150	81

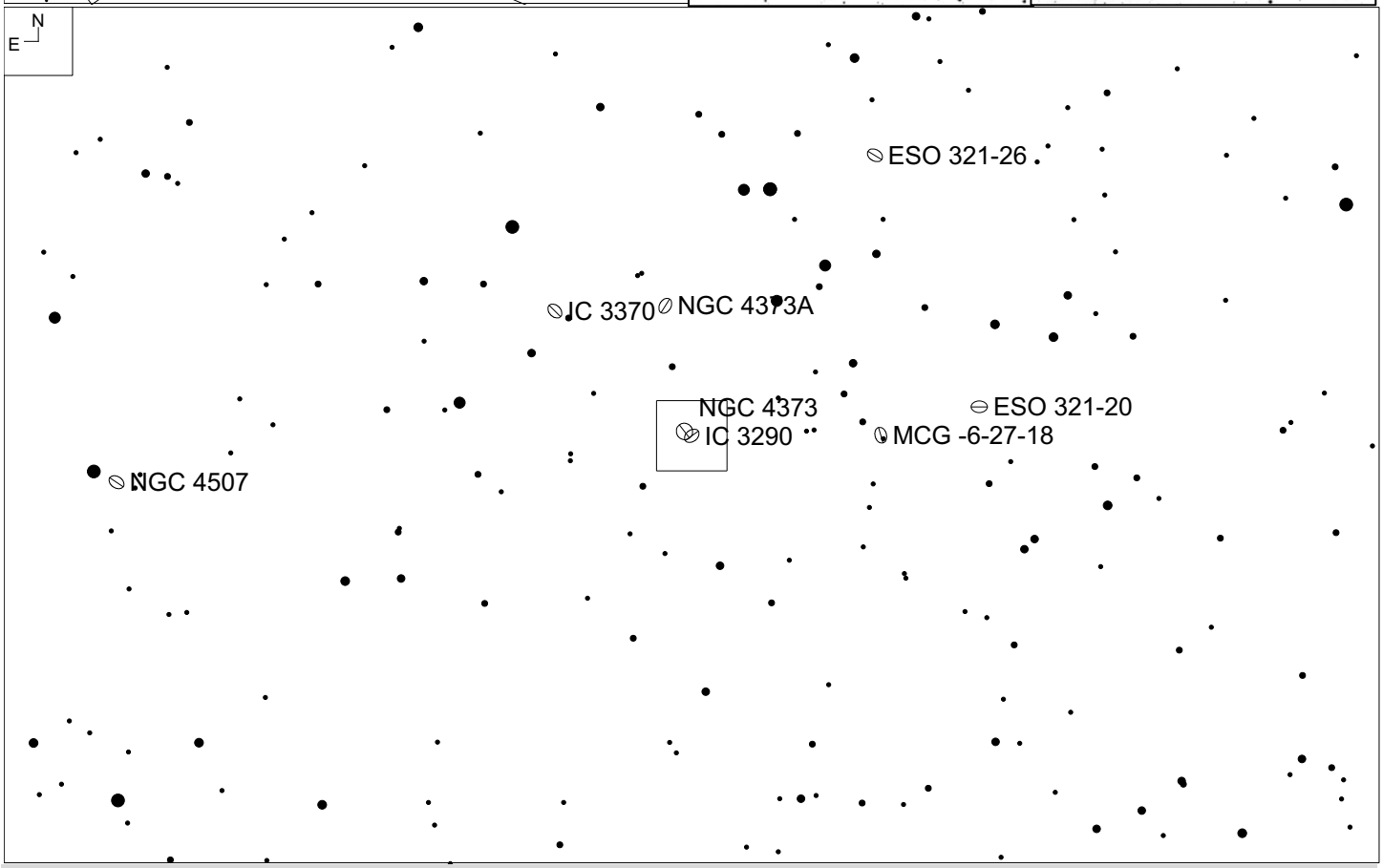
IC 3253 (Centaurus)



Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG -6-27-21	12 23 45.2	-34 37 20	11.6V	2.8’ x 1.1’	Sc	168	81

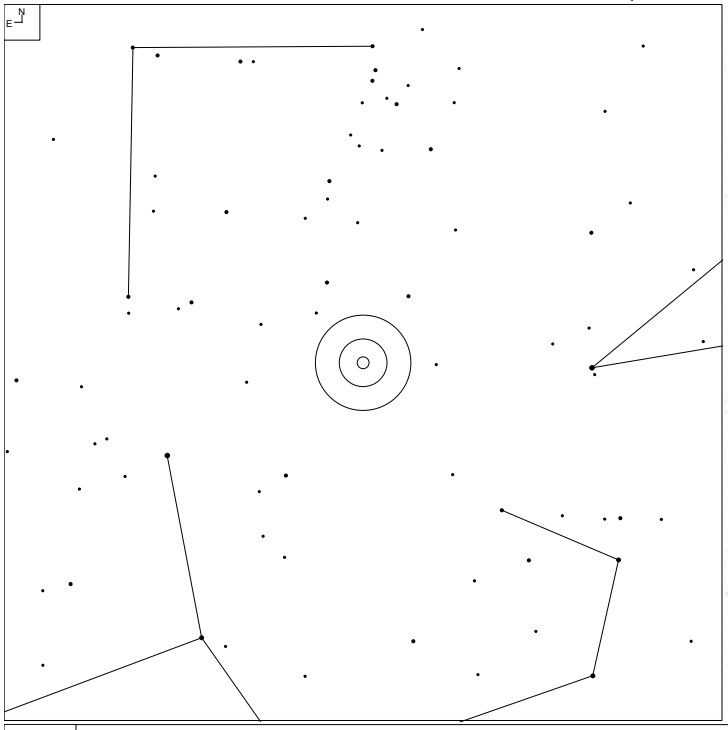
IC 3290 and 3370 (Centaurus)

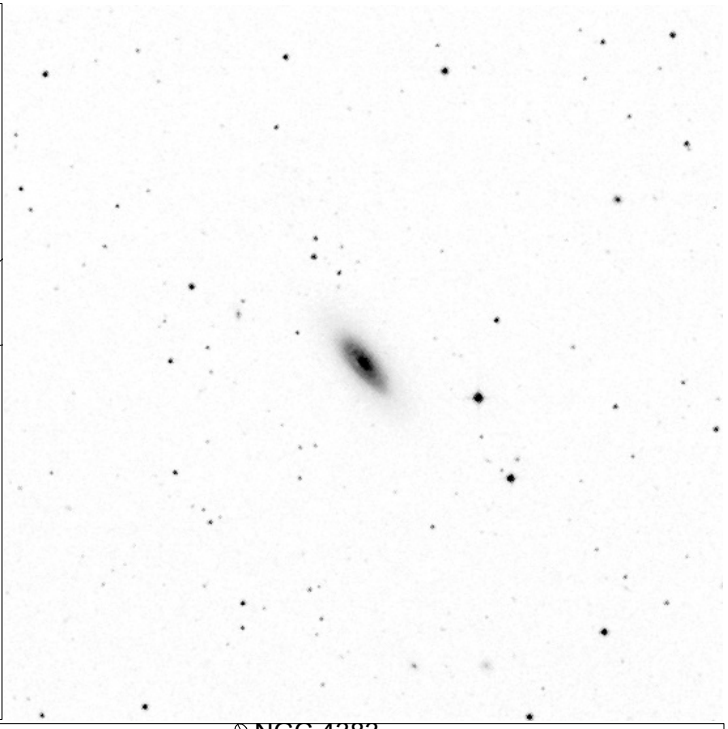


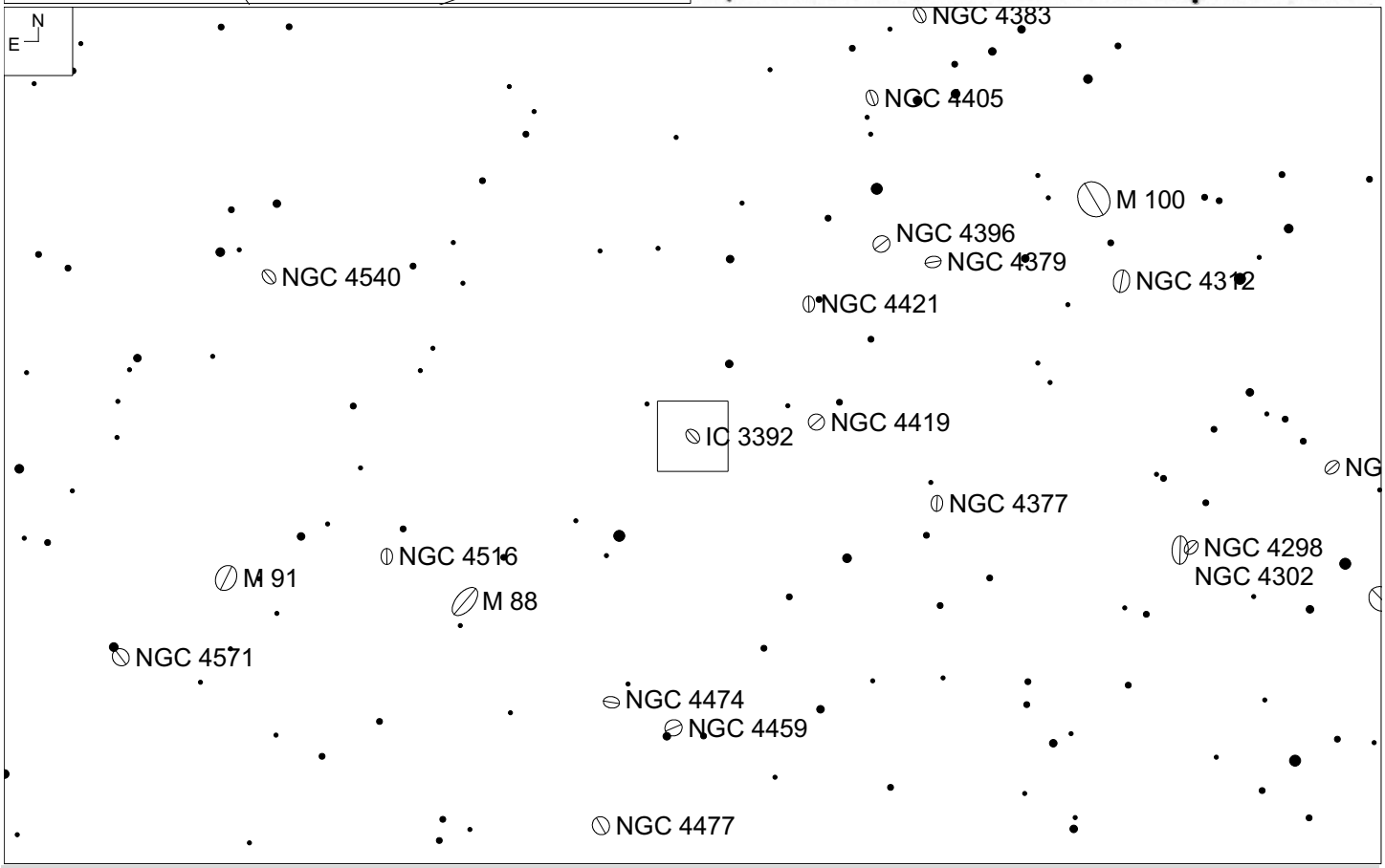


IC	Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
3290	MCG -6-27-24	12 25 09.0	-39 46 32	12.0V	1.6’ x 1.3’	S0-a	168	93
3370	MCG -6-27-29	12 27 37.3	-39 20 16	12.2v	2.9’ x 2.3’	E2 – E3		

IC 3392 (Coma Berenices)

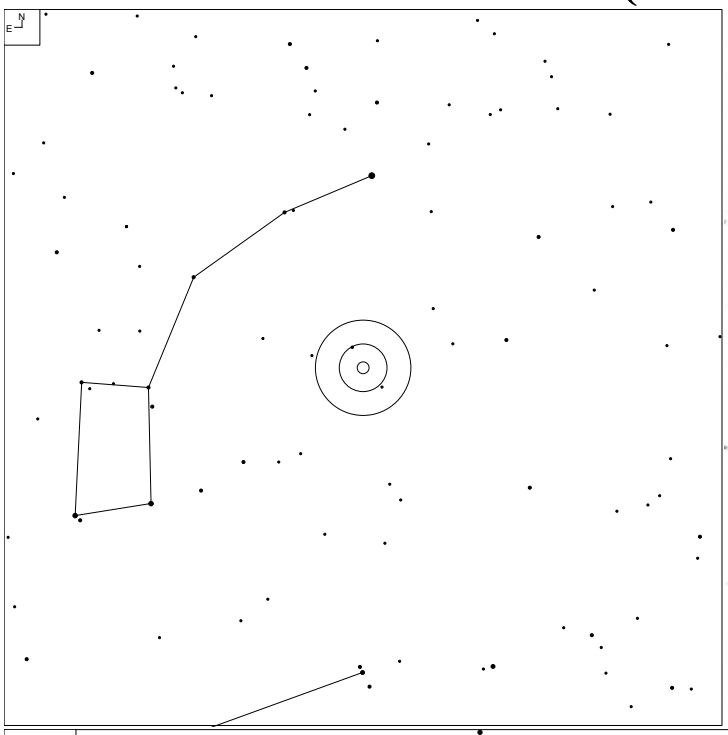


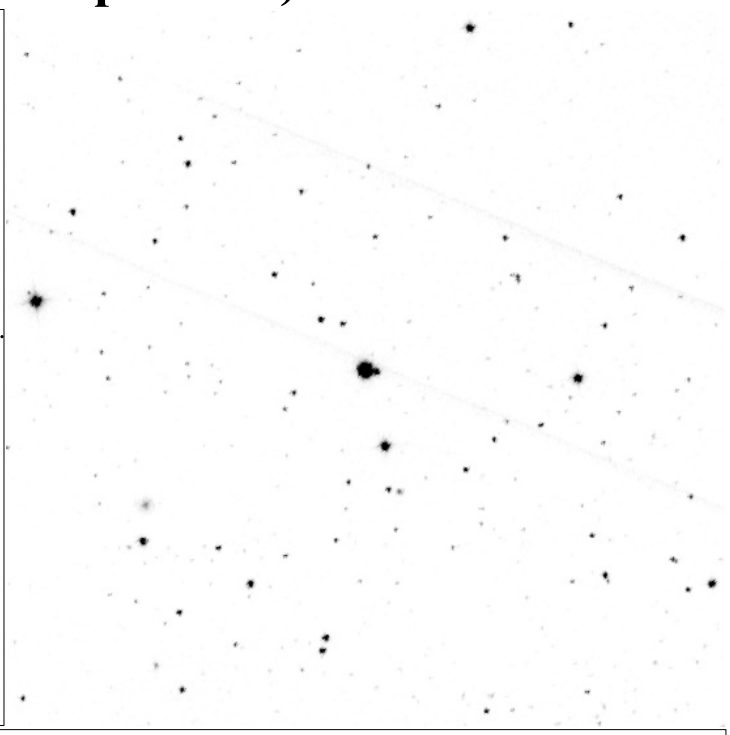


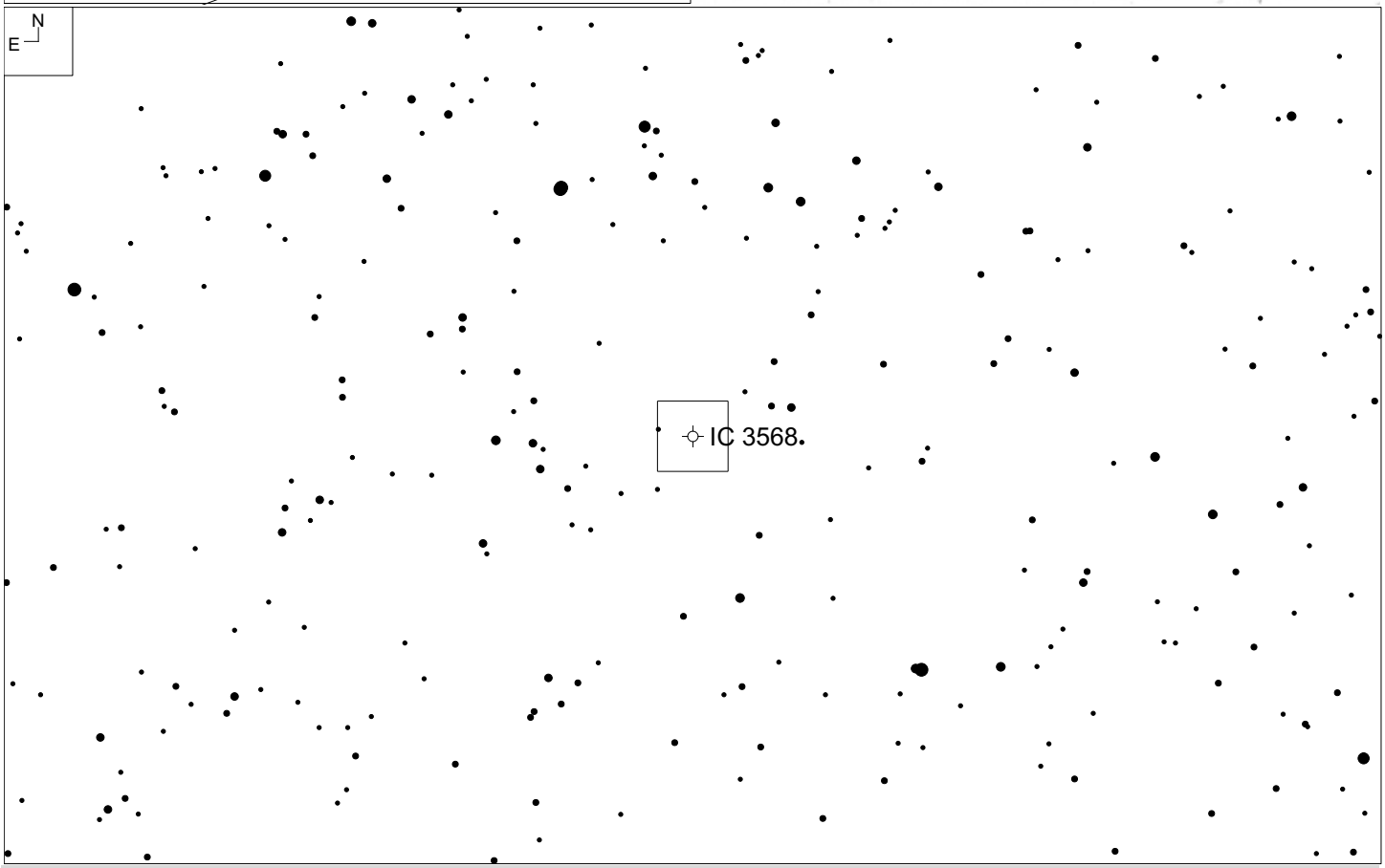


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG 3-32-49	12 28 43.3	+14 59 58	12.5V	2.3’ x 1.0’	SAb	91	45

IC 3568 (Camelopardalis)

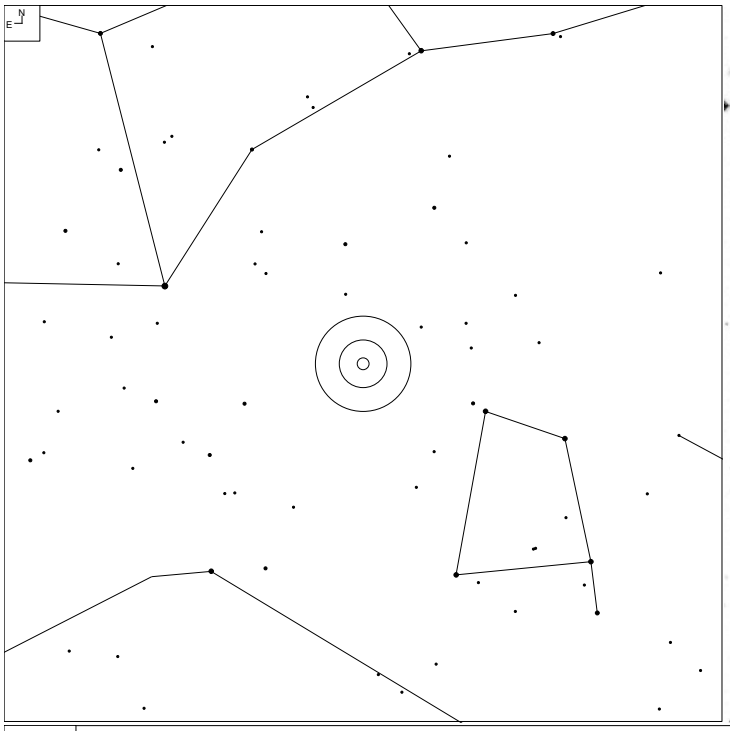


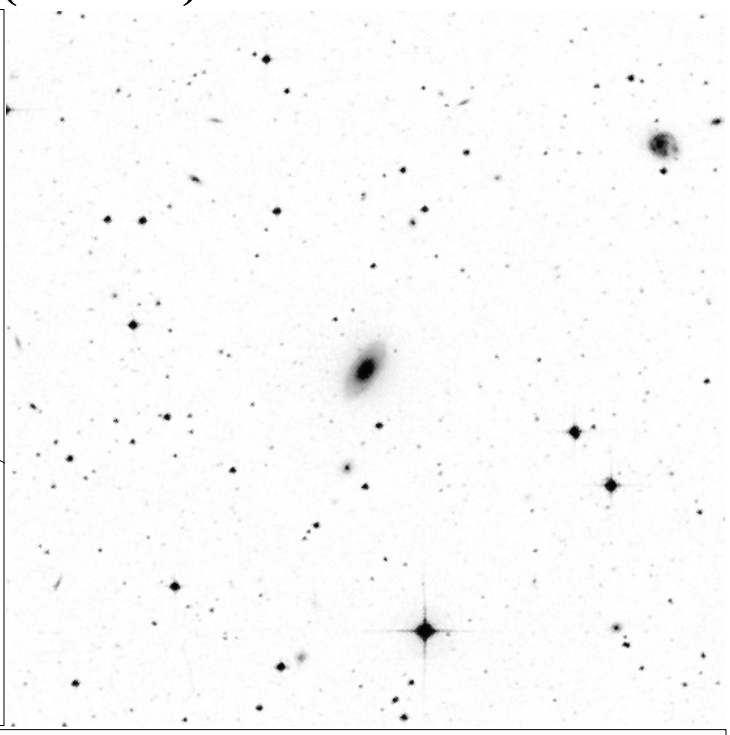


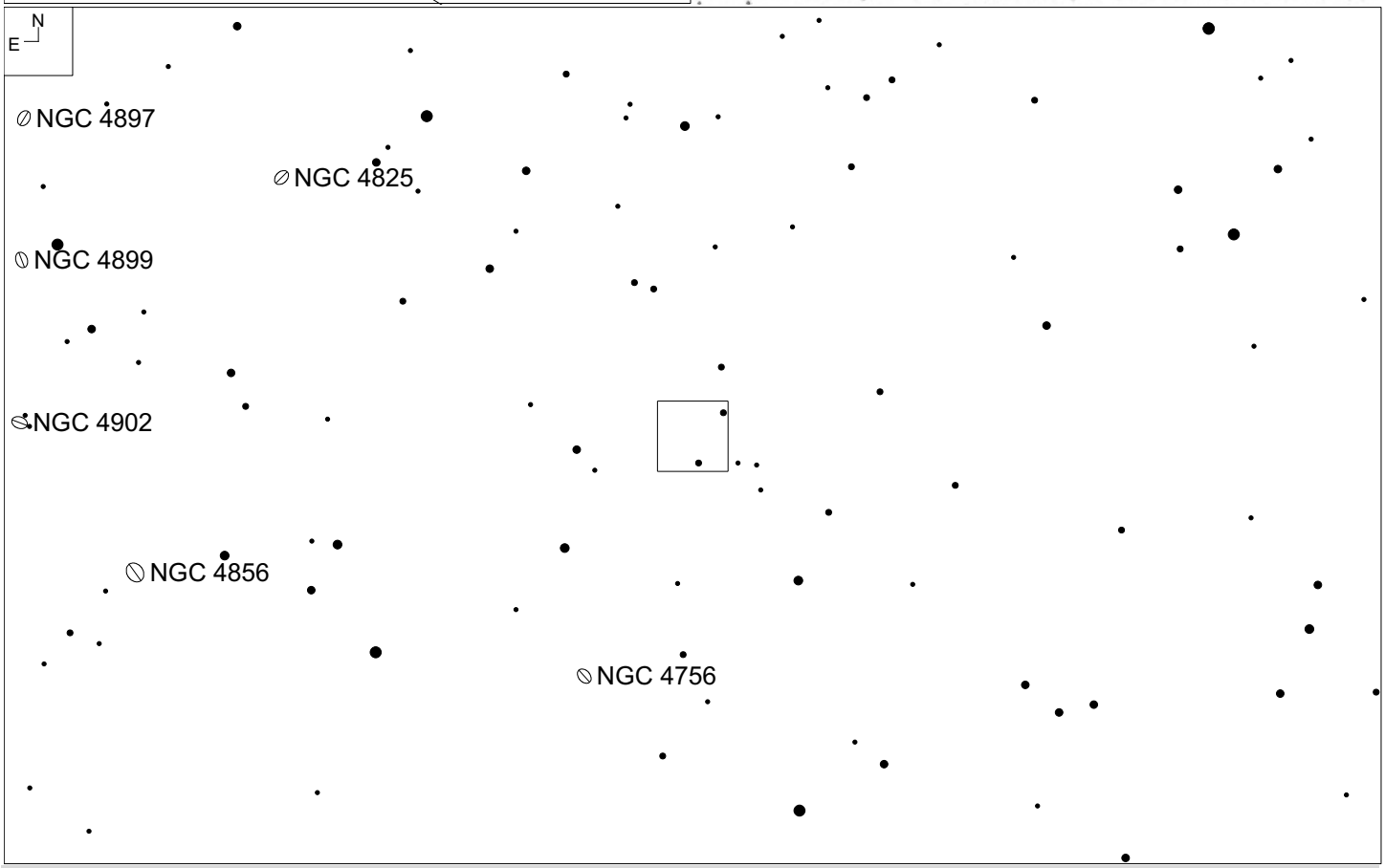


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Lemon Slice	12 33 06.9	+82 33 50	11.6	20.0”	II+IIa	5	1

IC 3831 (Corvus)

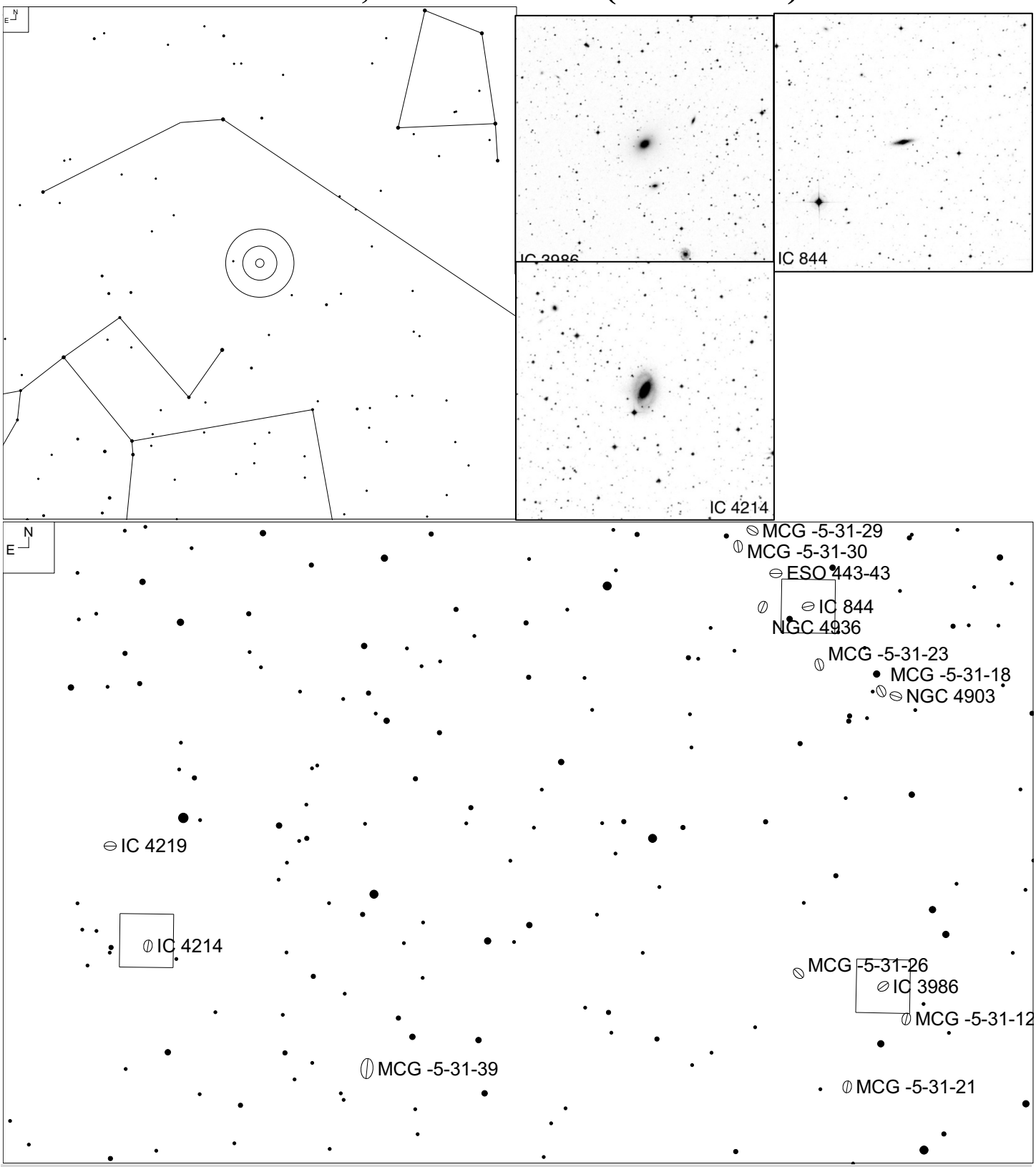






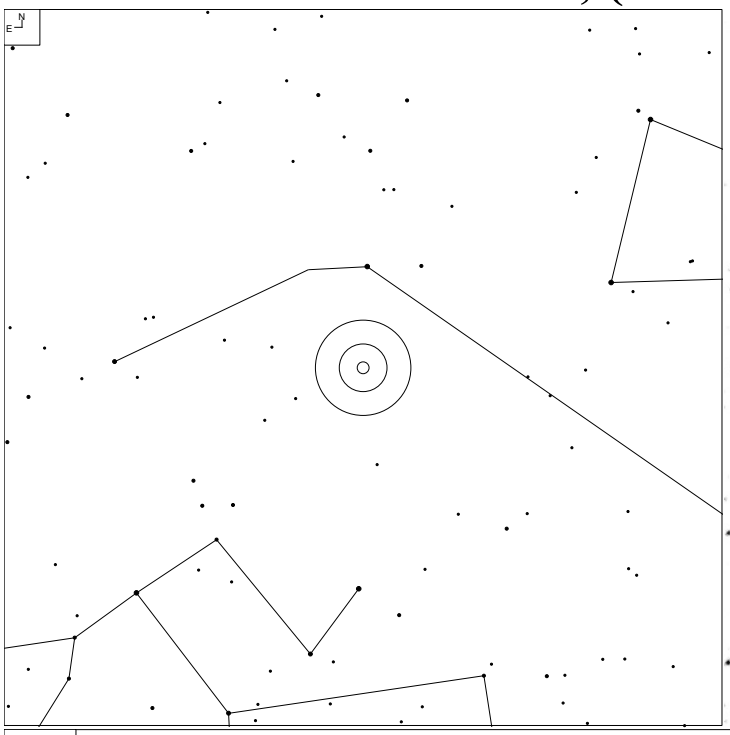
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG -2-33-27	12 51 18.6	-14 34 25	13.6B	1.4’ x 0.8’	SAB(s)0	130	69

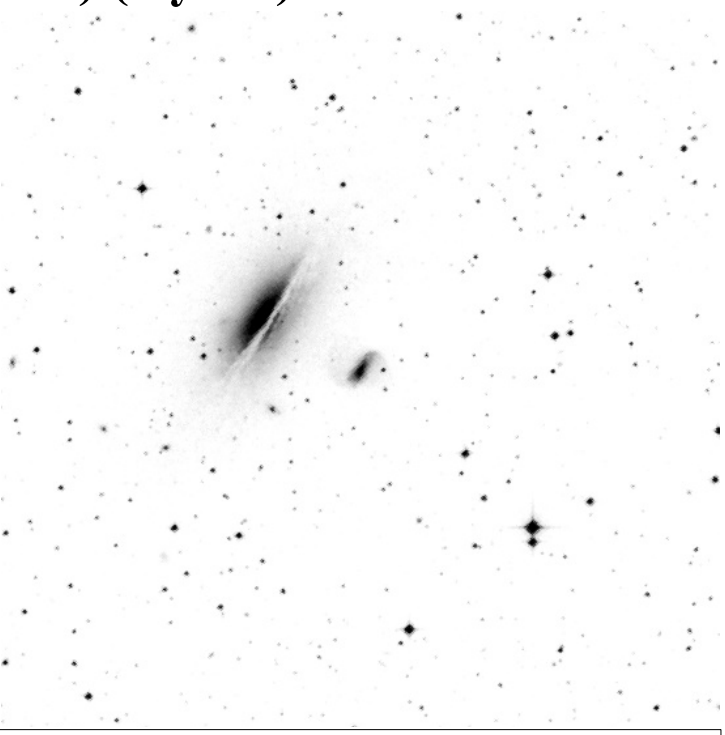
IC 3986, 844 and 4214 (Centaurus)

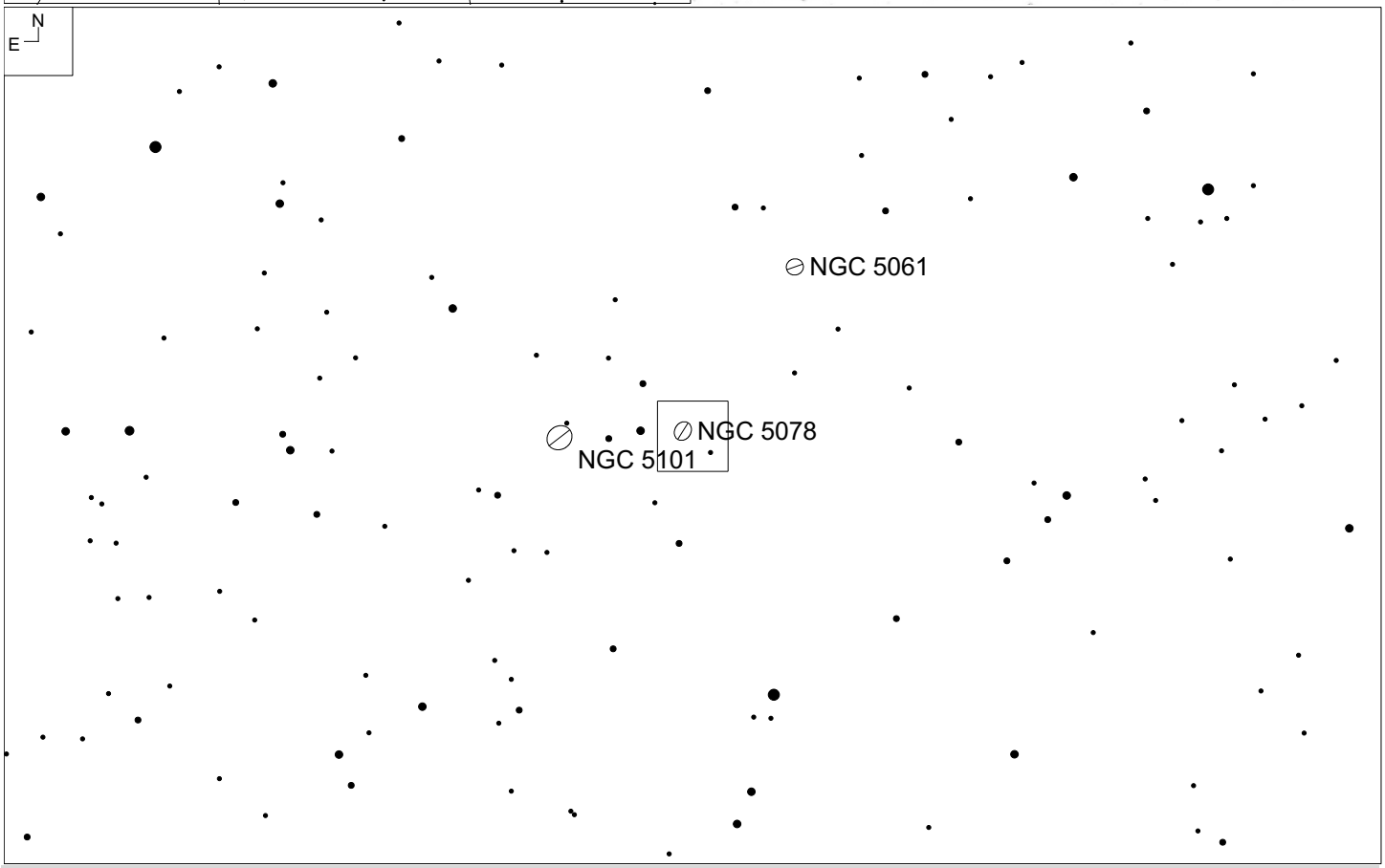


IC	Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
3986	MCG -5-31-16	13 01 32.1	-32 17 28	13.35b	1.9’ x 1.4’	E / SAB0	167	81
844	MCG -5-31-24	13 03 18.2	-30 31 16	13.7	1.6’ x 1.1’	S0 sp		
4214	MCG -5-31-43	13 17 42.7	-32 06 06	12.3	2.8’ x 1.5’	SB(r)ab		

IC 879, (IC 4222) (Hydra)

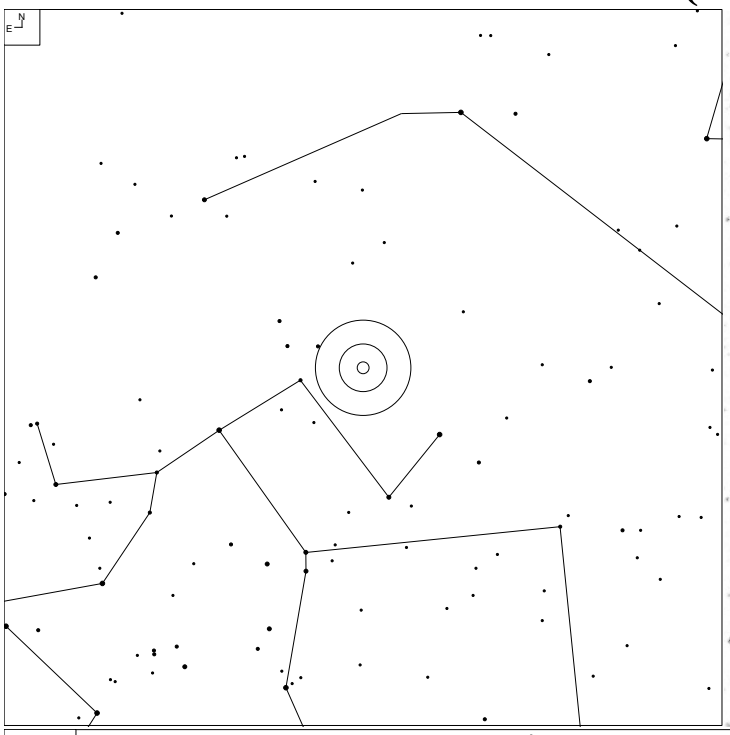


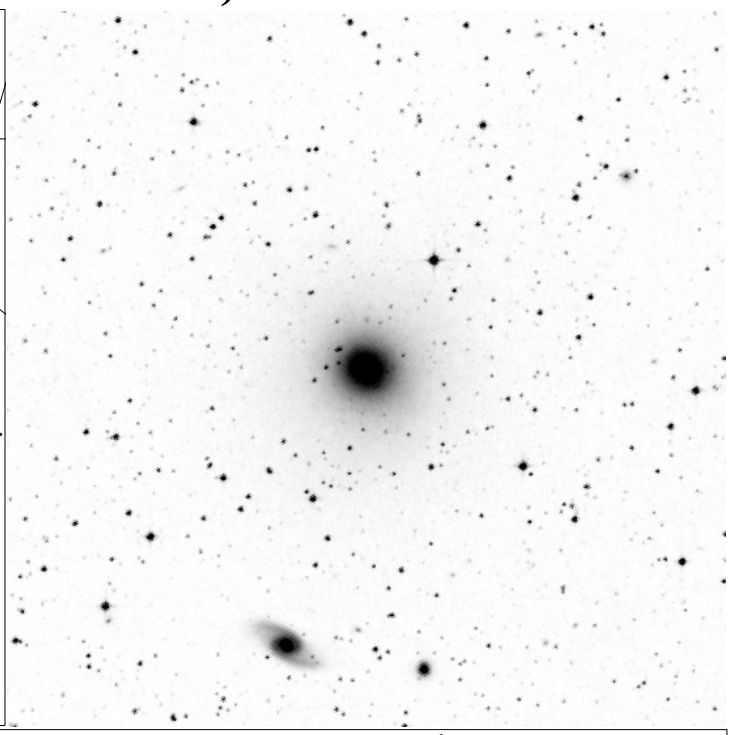


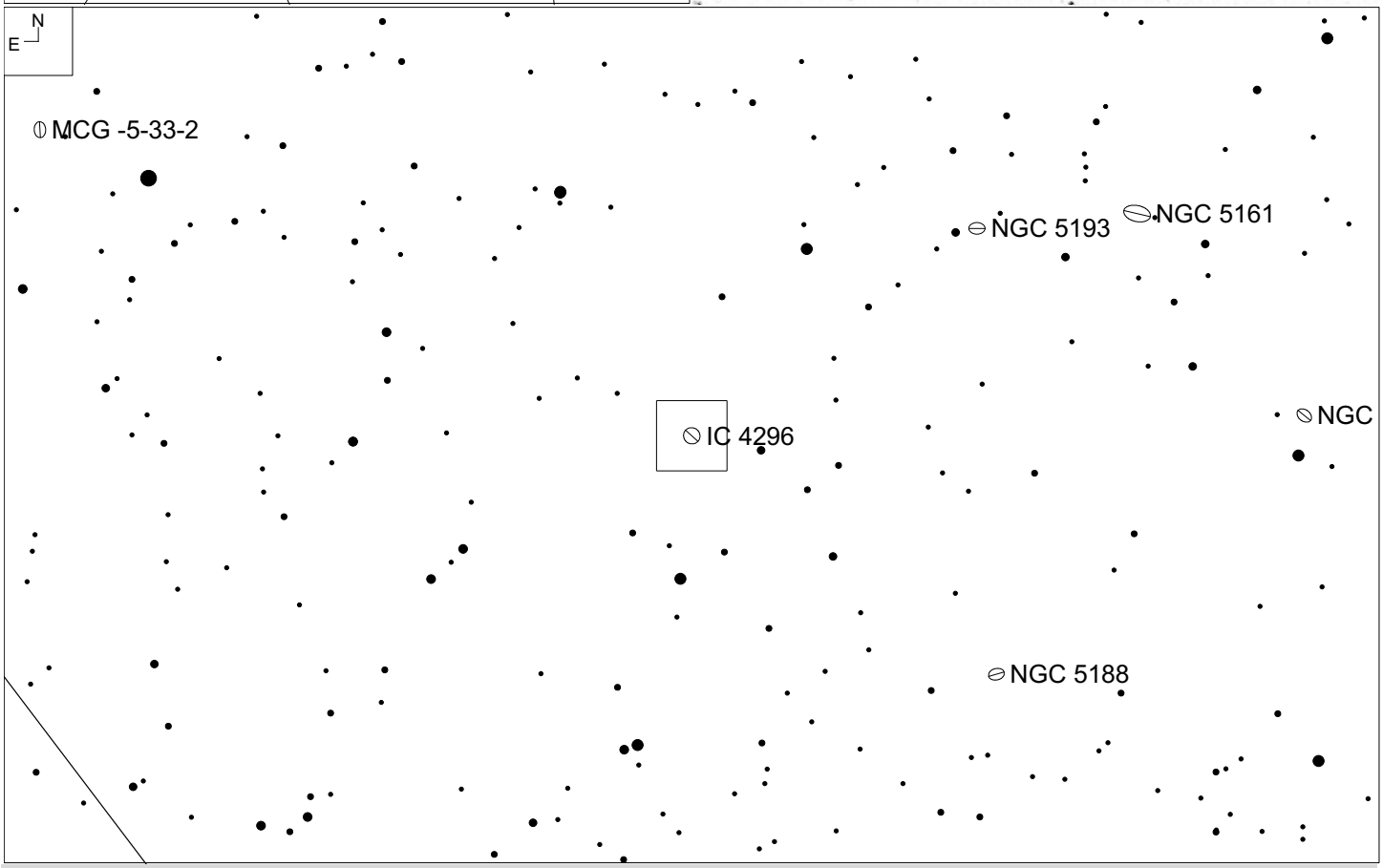


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG -4-31-52	13 19 40.6	-27 25 44	14.2	1.3’ x 1.1’	SB(s)ab pec	149	81

IC 4296 (Centaurus)

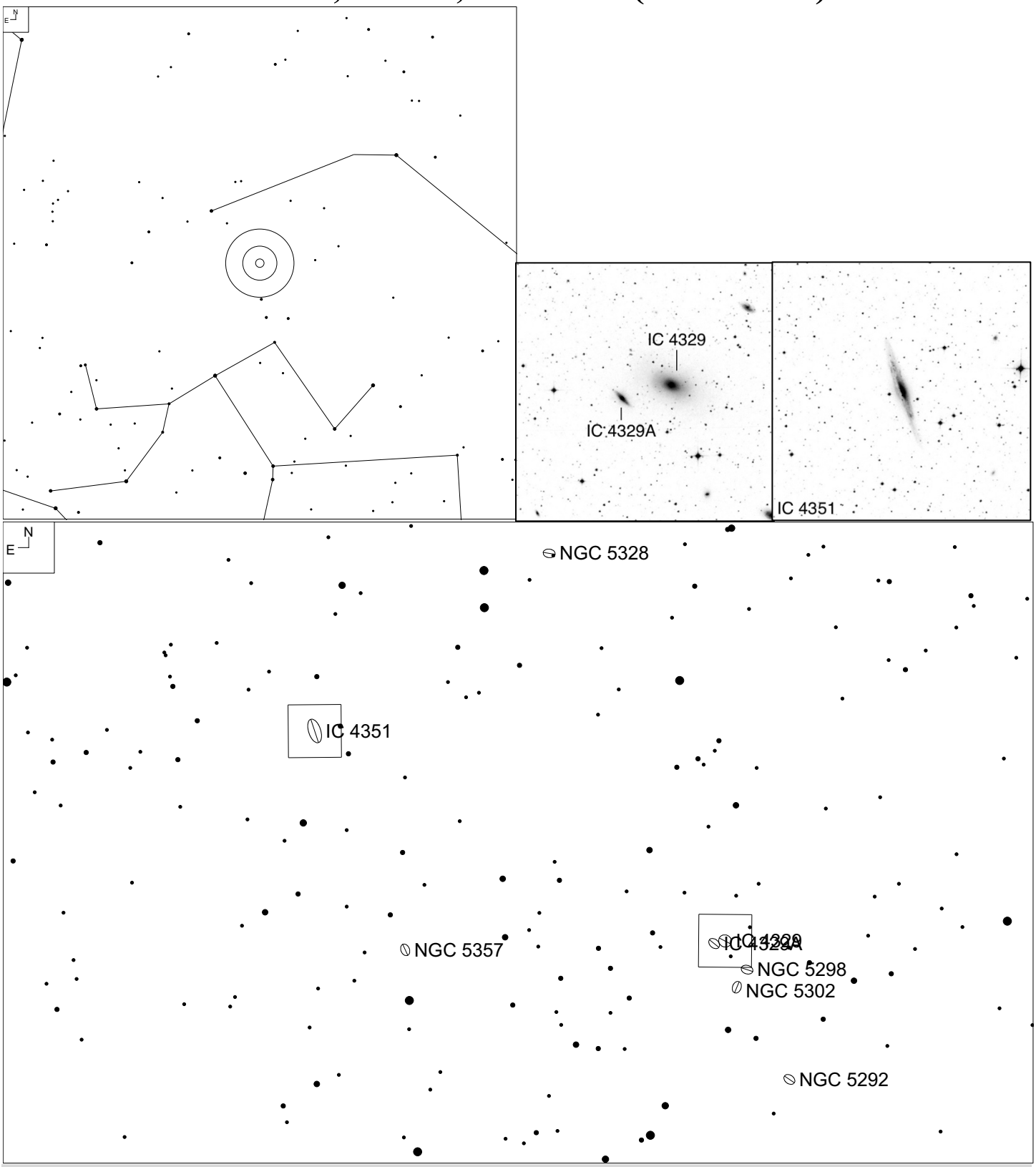






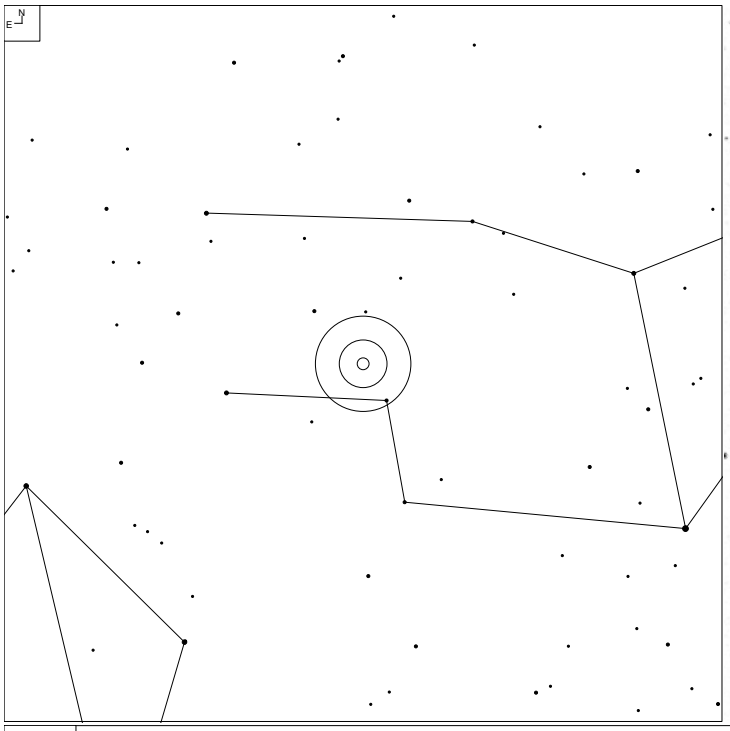
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG -6-30-16	13 36 39.0	-33 57 57	11.6	3.4’ x 3.2’	E	167	81

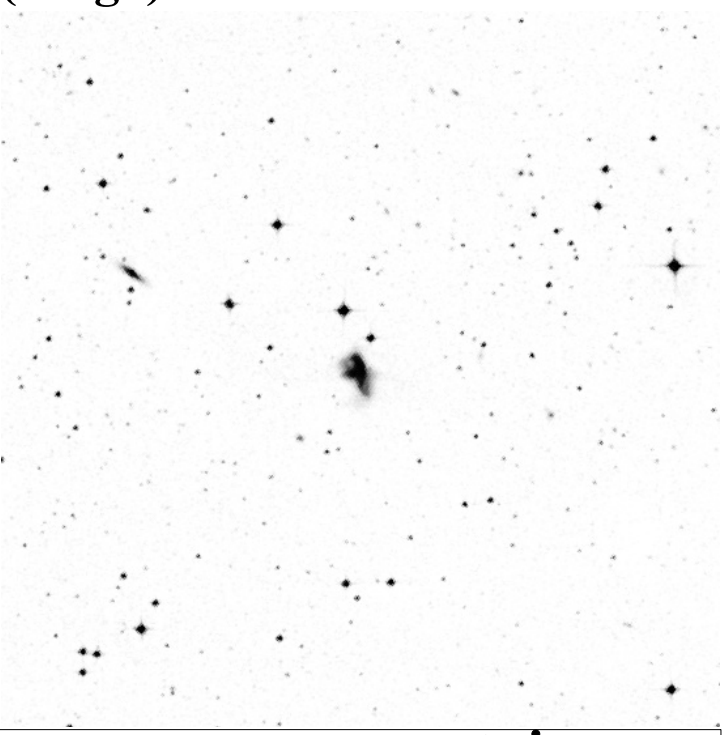
IC 4329, 4329A, and 4351 (Centaurus)

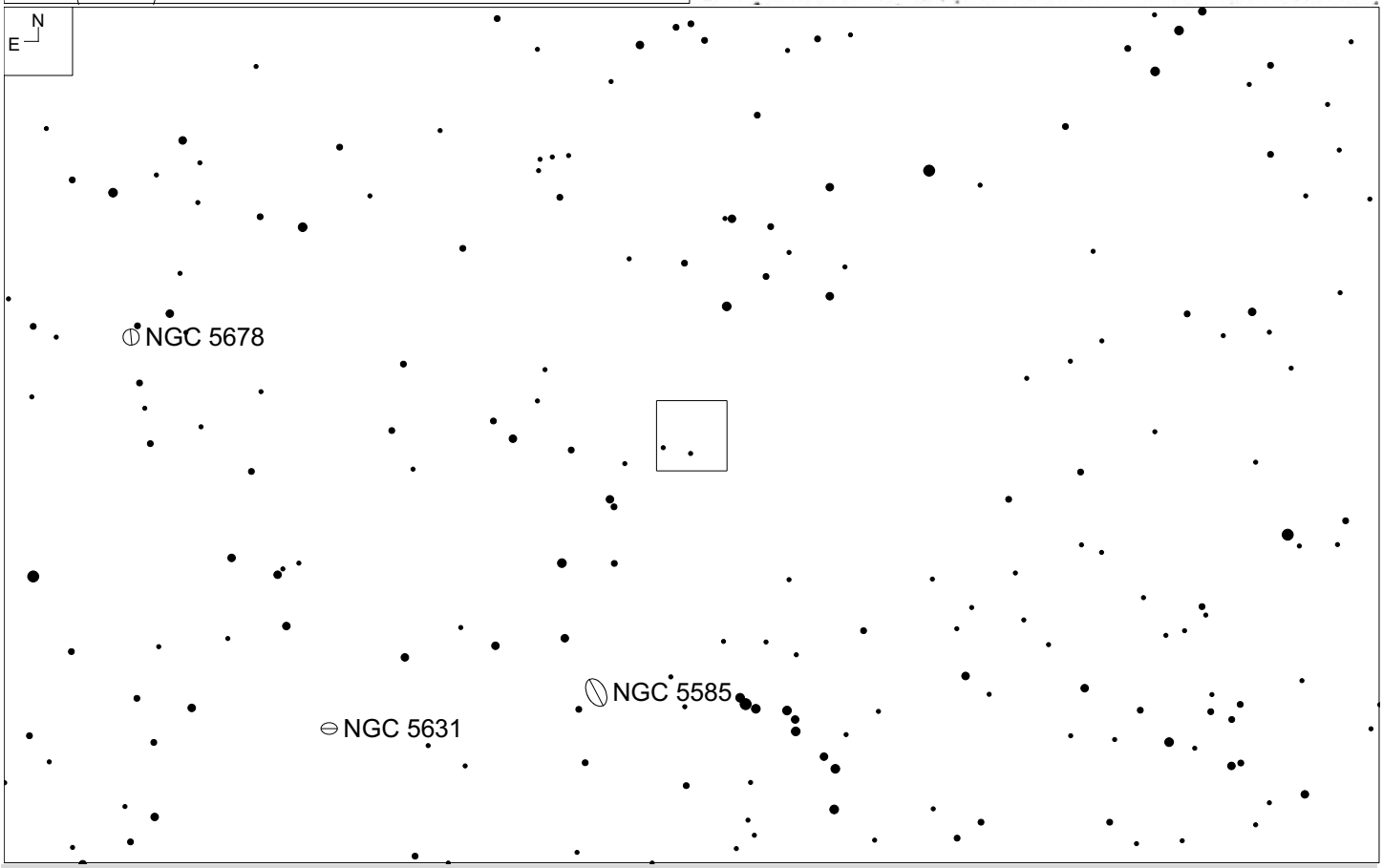


IC	Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
4329	MCG -5-33-19	13 49 05.3	-30 17 45	12.2B	3.5’ x 2.2’	SAB(s)0	167	81
4329A	MCG -5-33-21	13 49 19.3	-30 18 34	13.0V	2.6’ x 0.5’	S0-a		
4351	MCG -5-33-34	13 57 54.3	-29 18 57	12.61B	6.8’ x 0.9’	SA(s)b:		

IC 997 (Virgo)

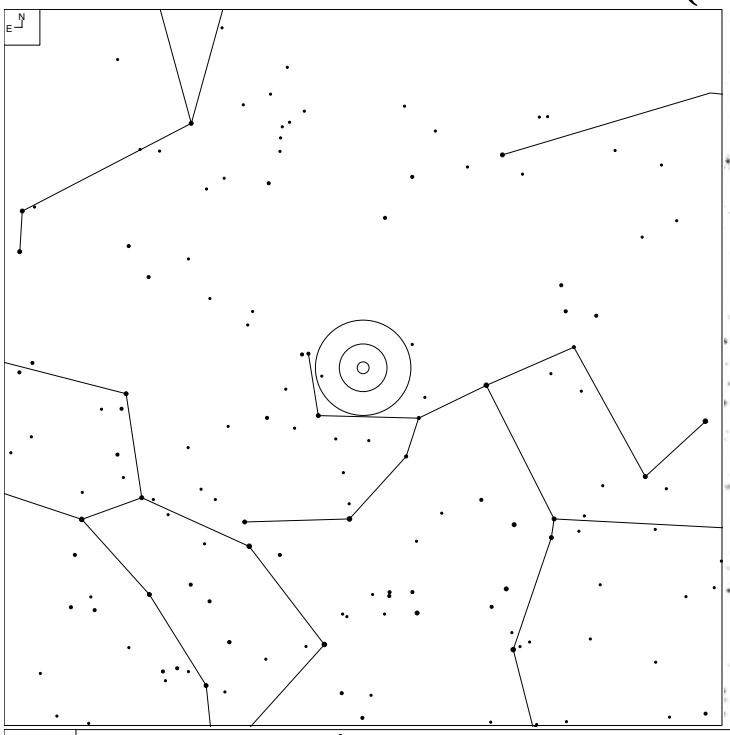


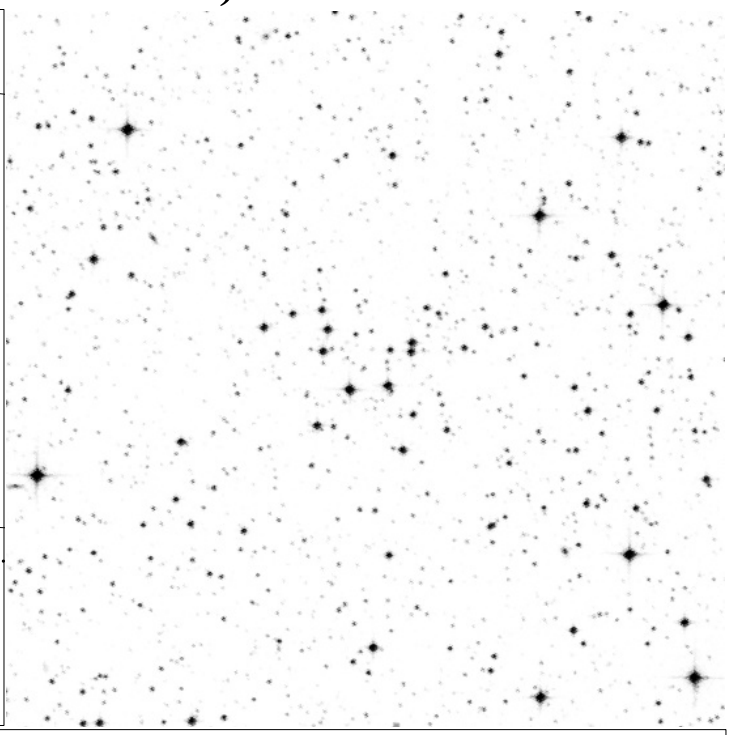


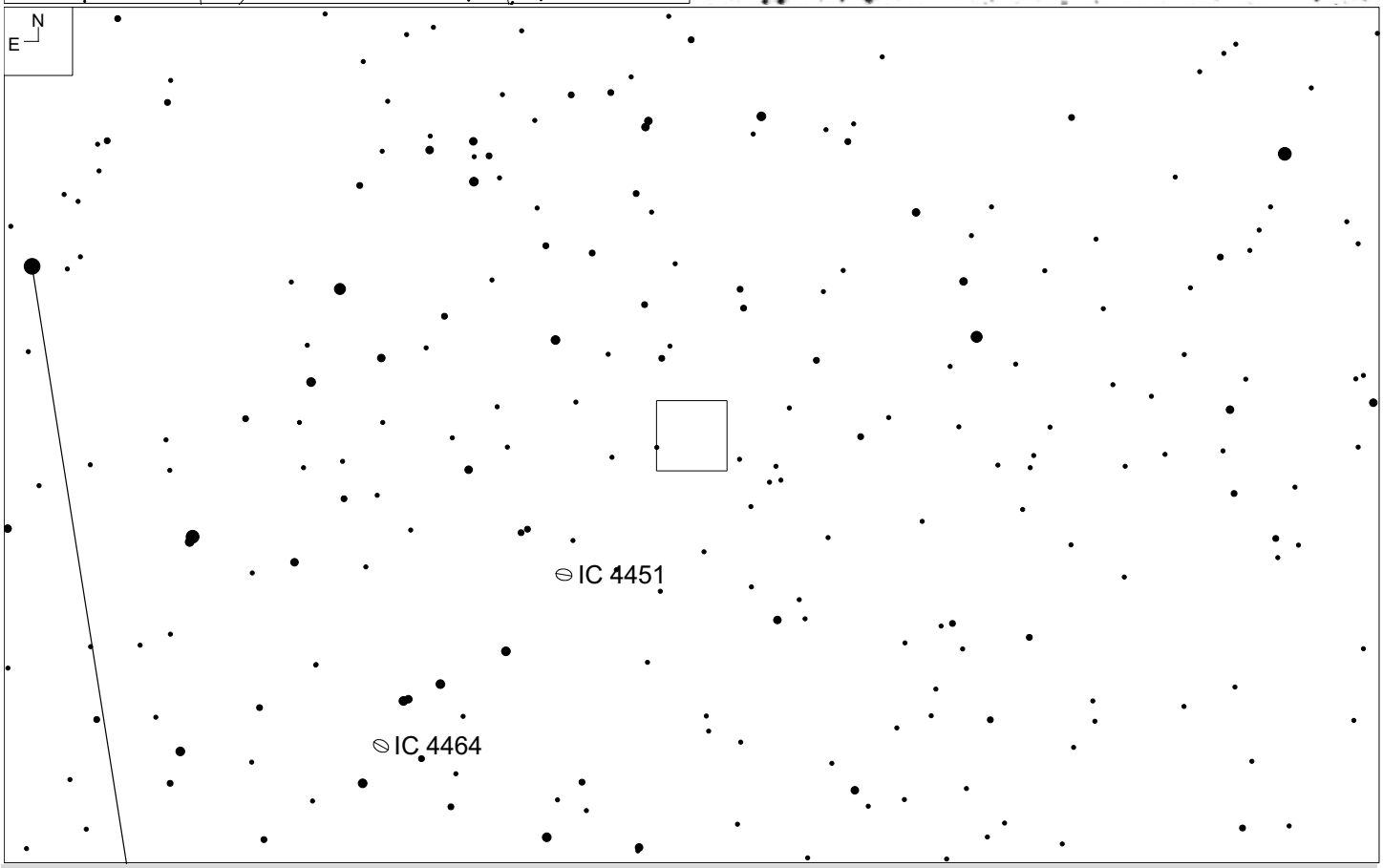


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG -1-37-1	14 19 59.2	-04 27 04	12.61B	6.8’ x 0.9’	SA(s)b: sp	109	56

IC 1023 (Centaurus)

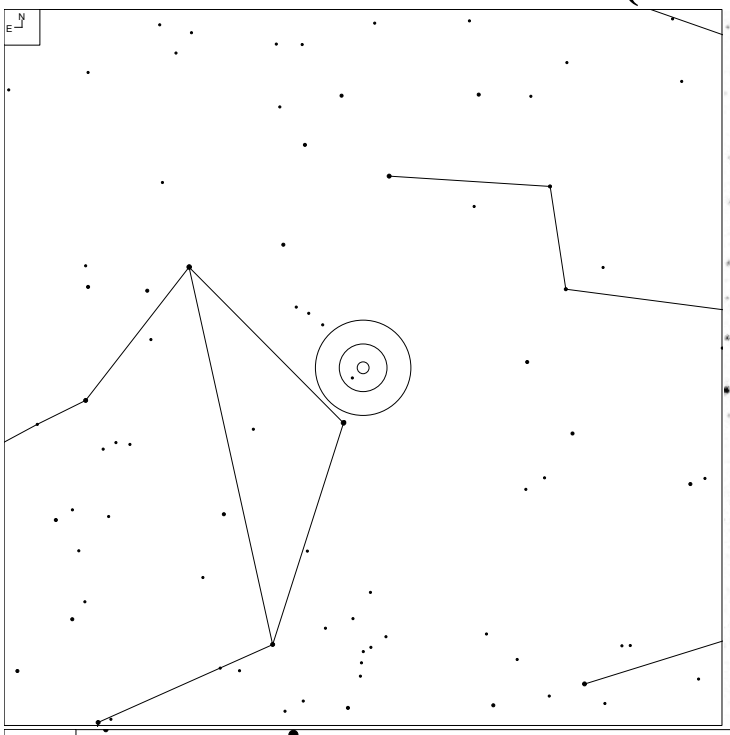


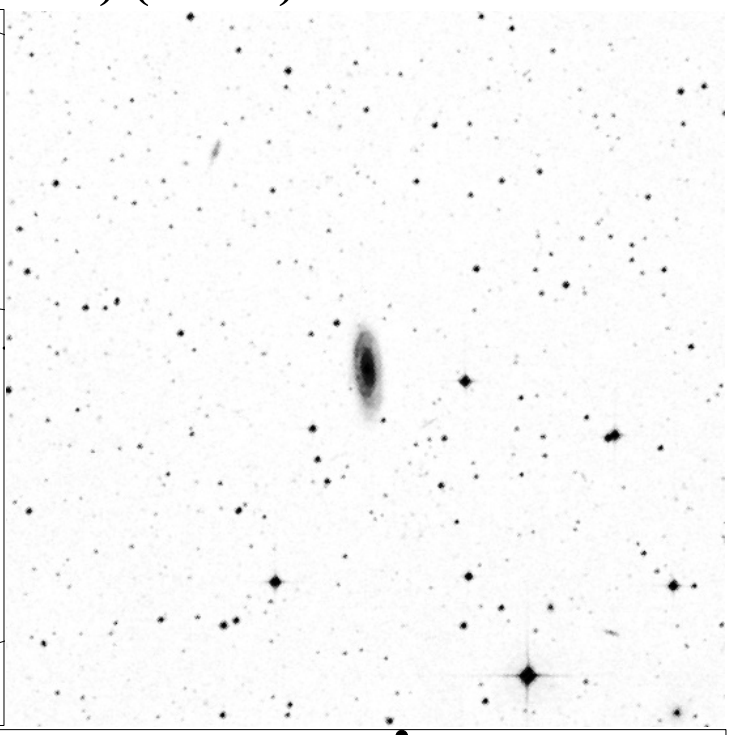


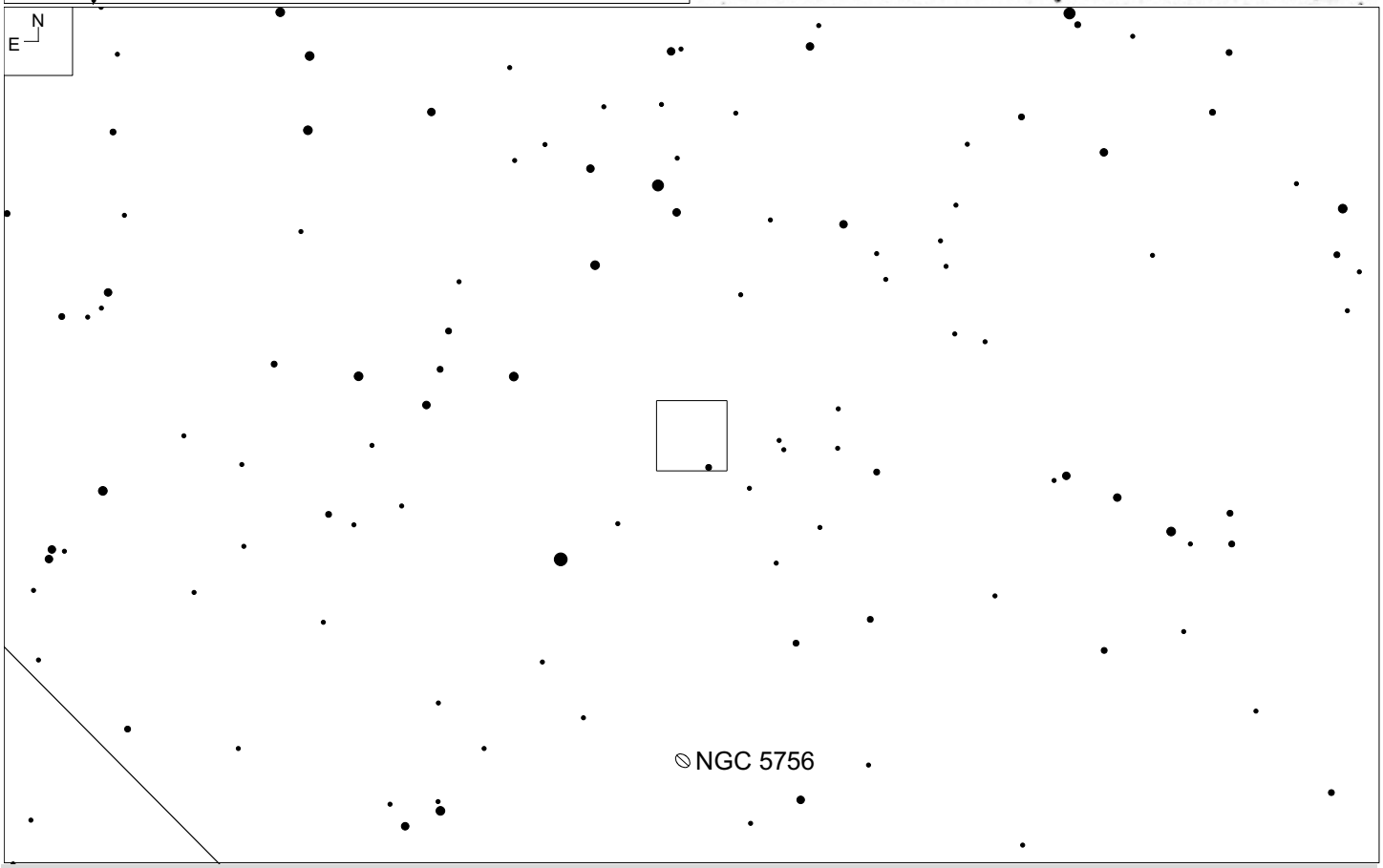


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
ESO 385-39	14 32 25.0	-35 48 12	10.4	4.8’ x 3.1’	O.C./Rem?	166	80

IC 1055 (IC 4491) (Libra)

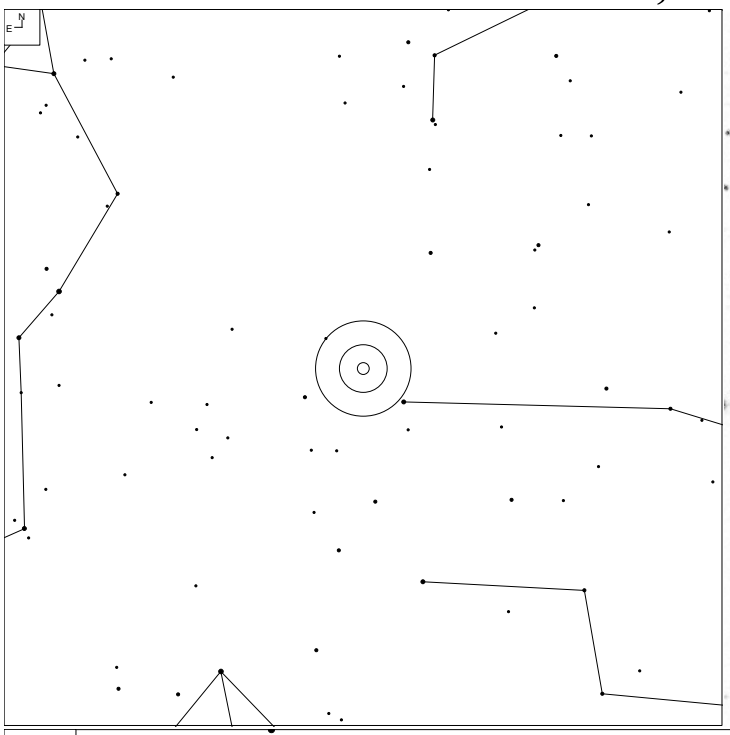


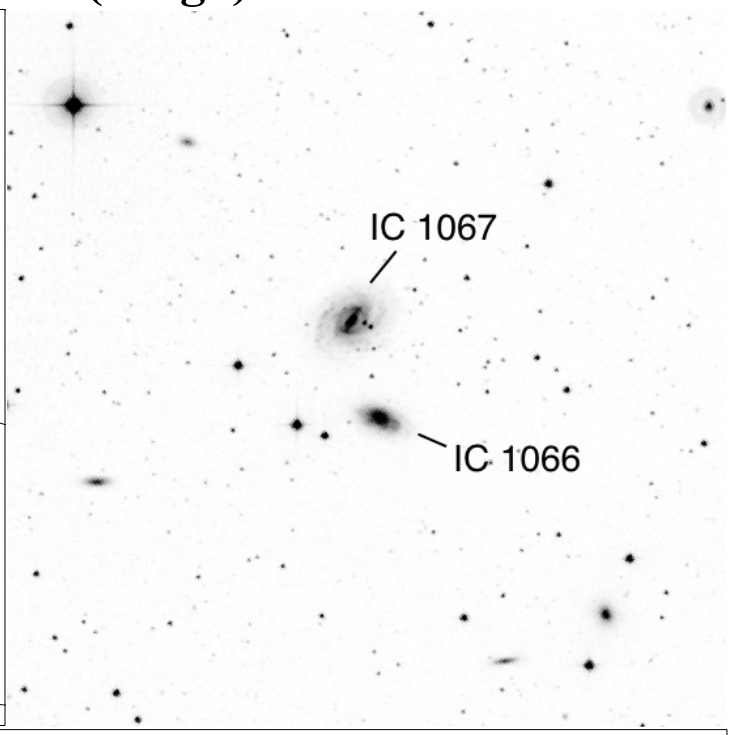


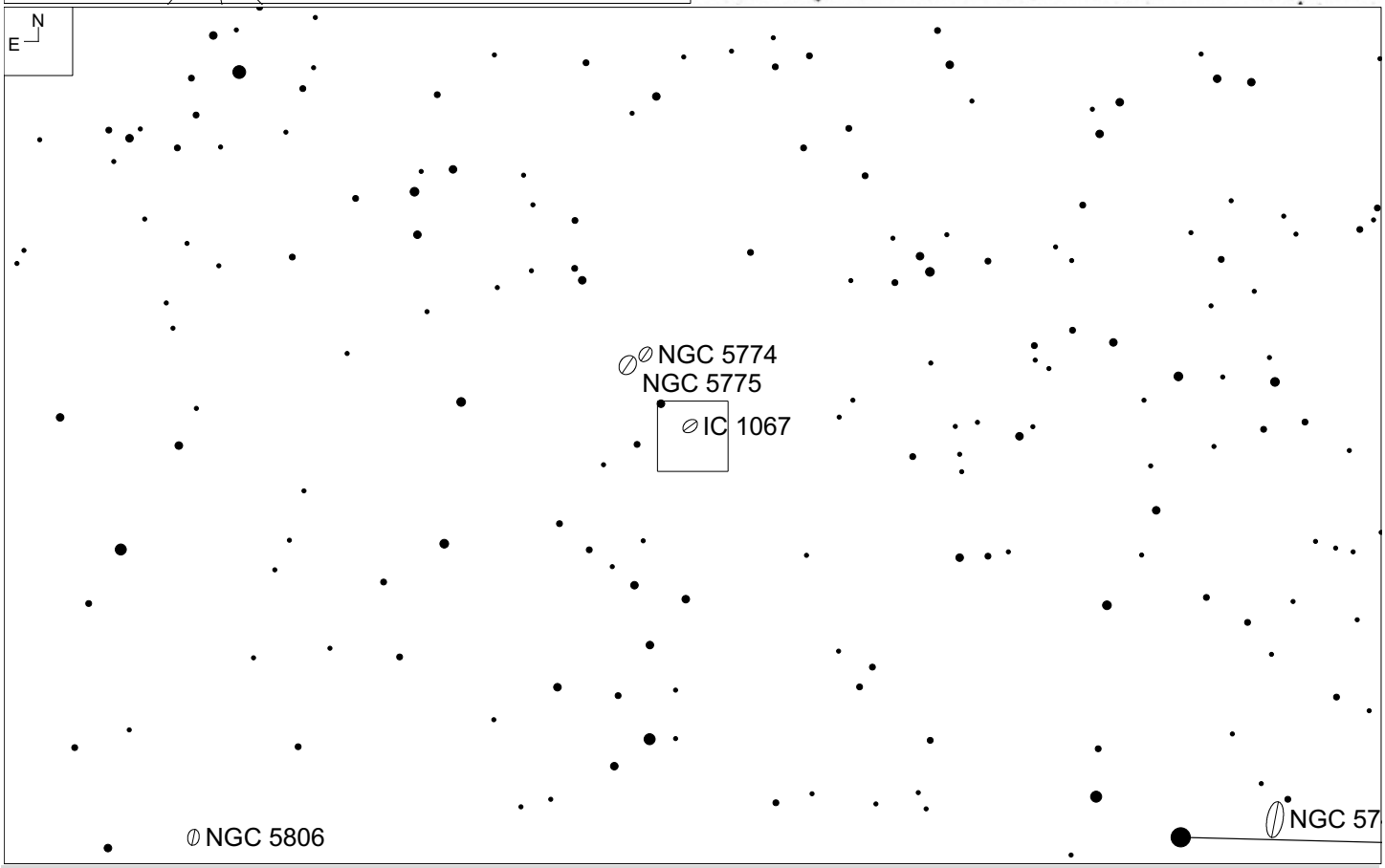


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG -2-38-11	14 47 25.7	-13 42 58	12.6V	2.0’ x 0.6’	Sb	129	68

IC 1066, 1067 (Virgo)

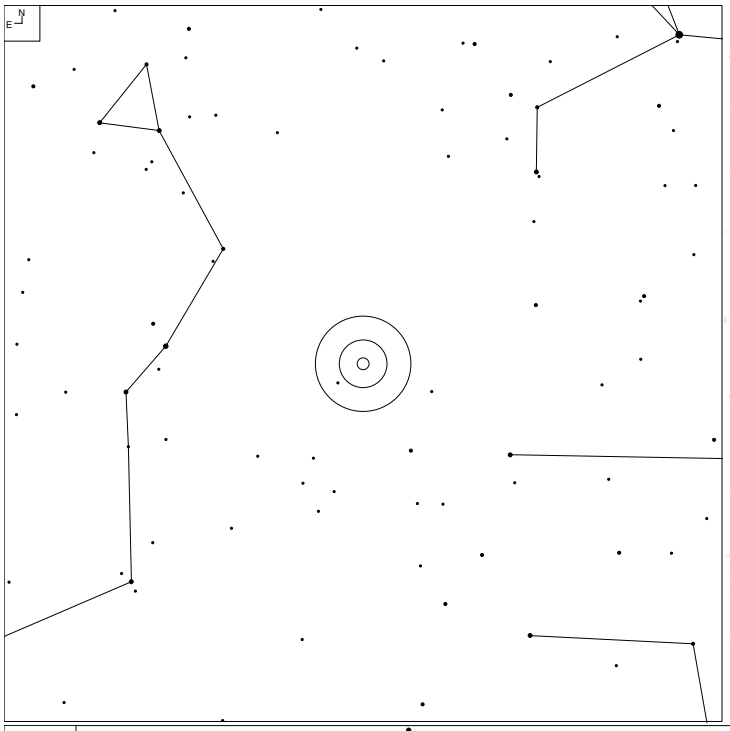


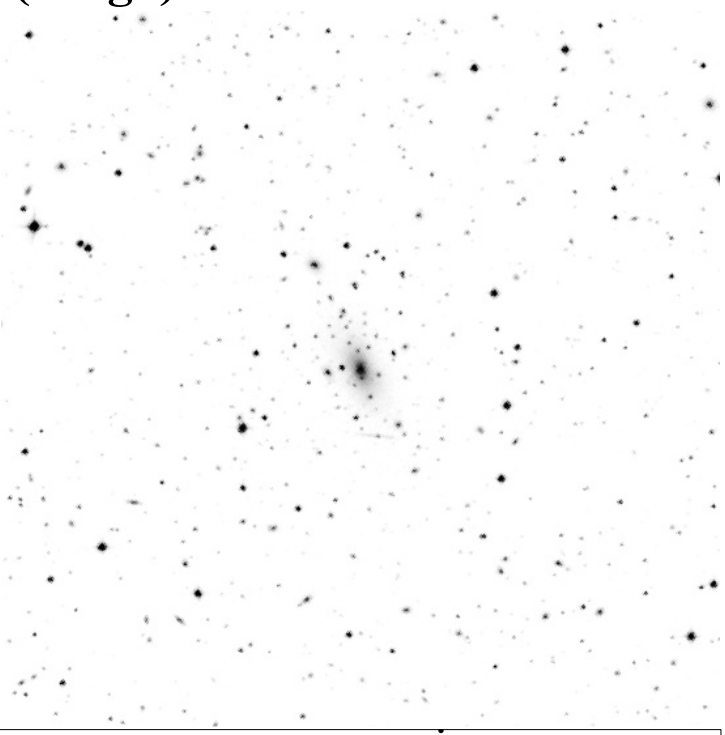


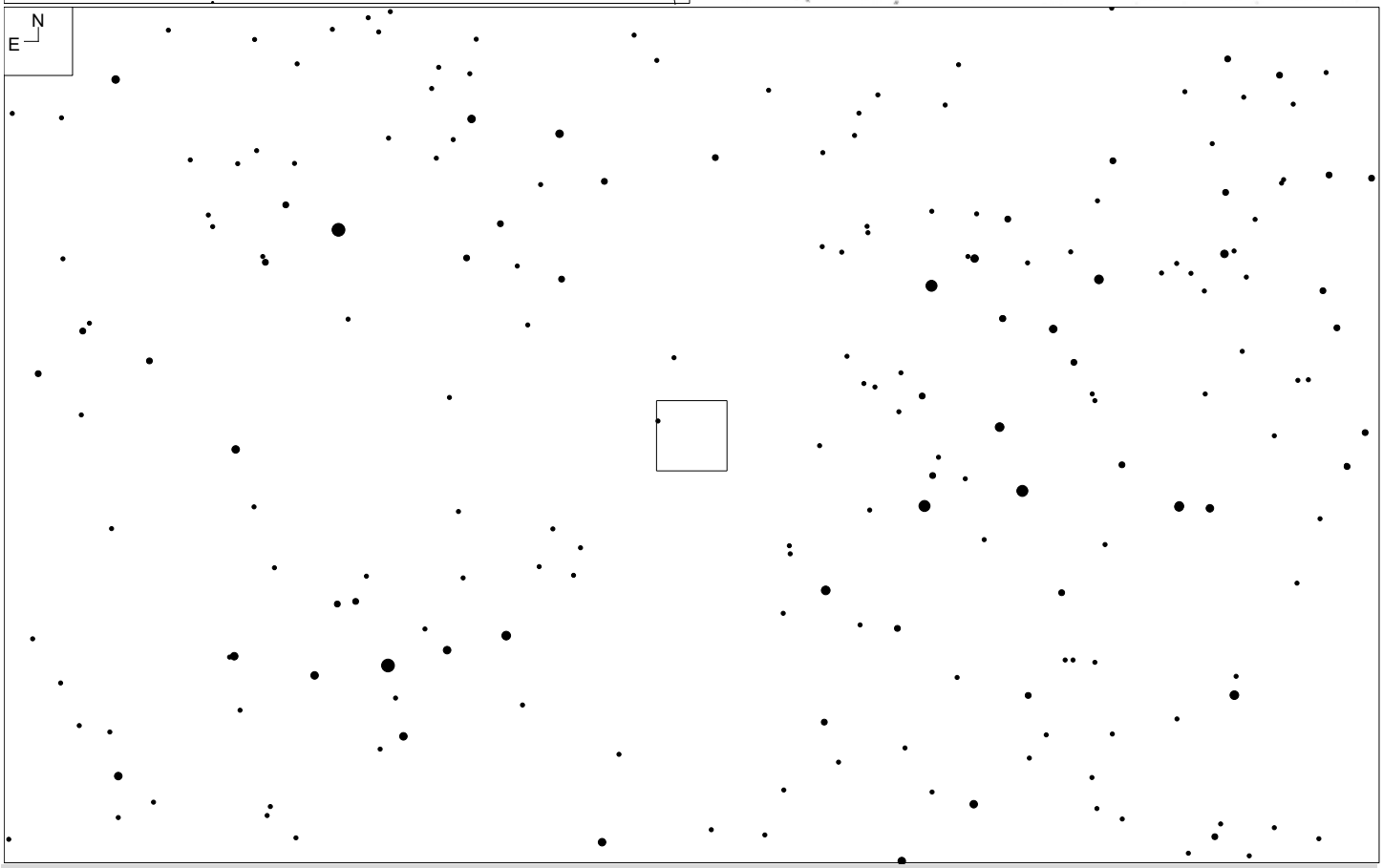


IC	Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
1066	MCG 1-38-9	14 53 02.9	+03 17 46	13.2V	1.4’ x 0.8’	Sbc	109	56
1067	MCG 1-38-10	14 53 05.2	+03 19 54	12.2V	2.2’ x 1.7’	SB(s)b		

IC 1101 (Virgo)

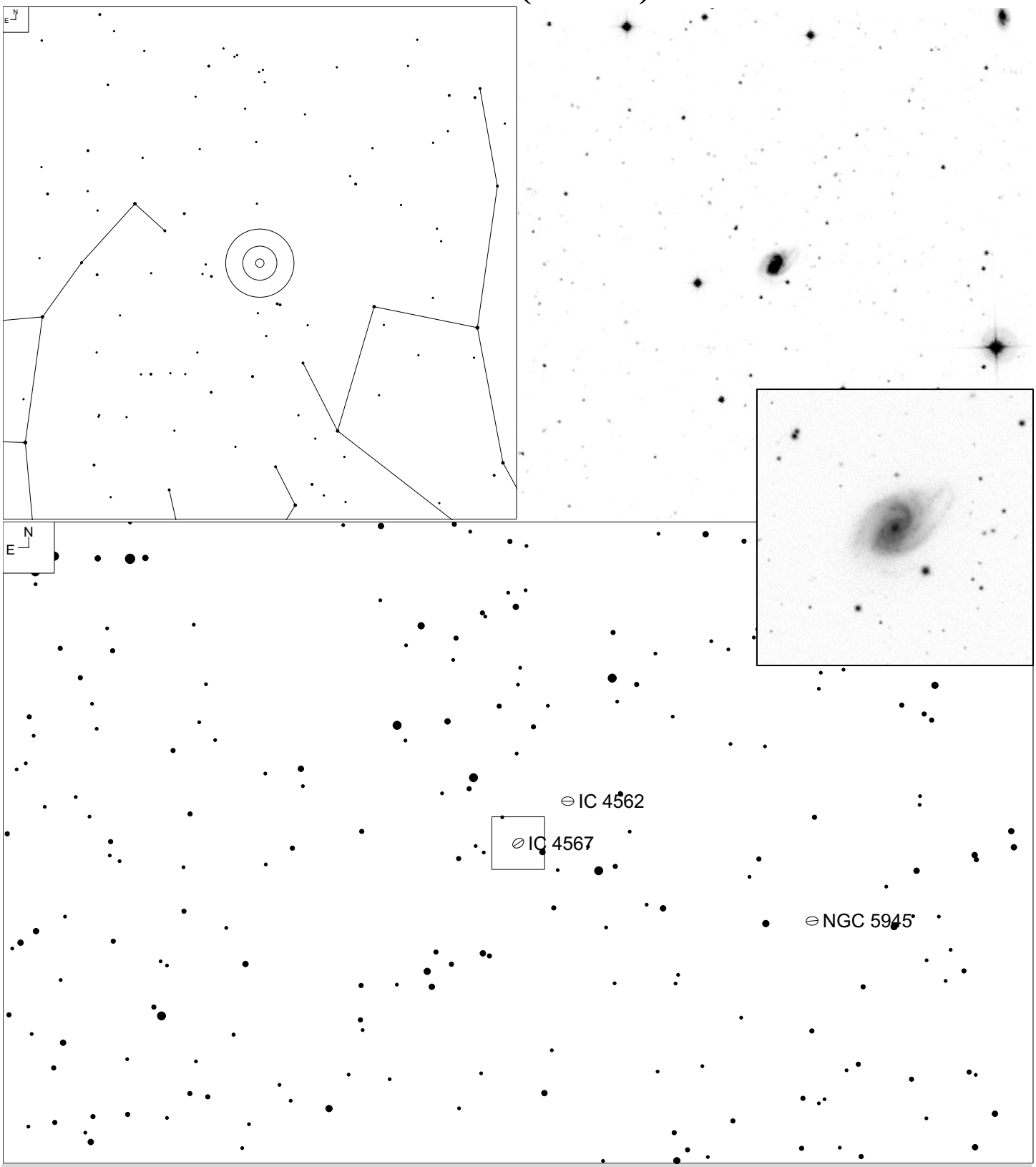






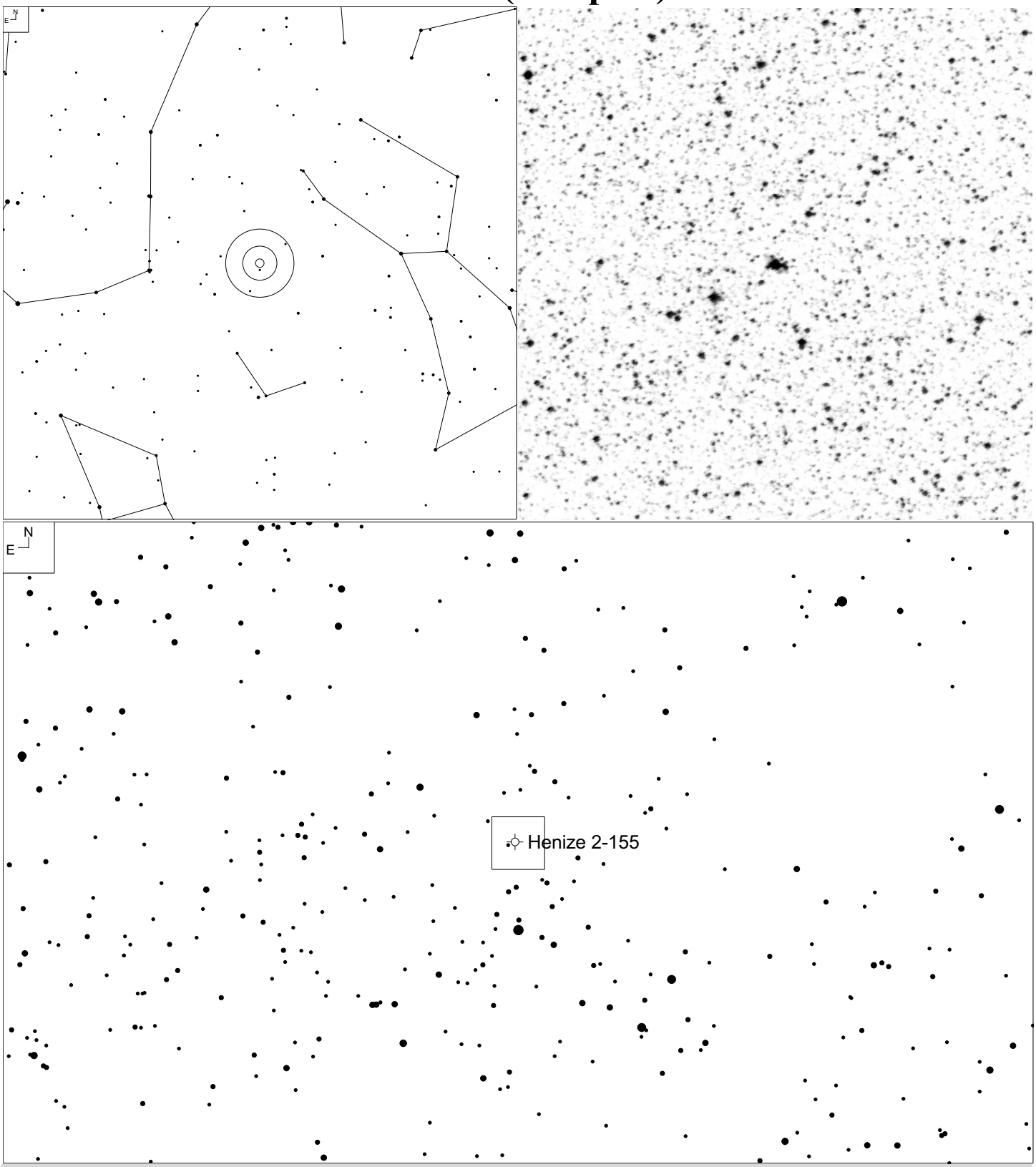
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
UGC 9752	15 10 56.1	+05 44 41	14.7V	1.2’ x 0.6’	E-S0 ?	108	56

IC 4567 (Boötes)



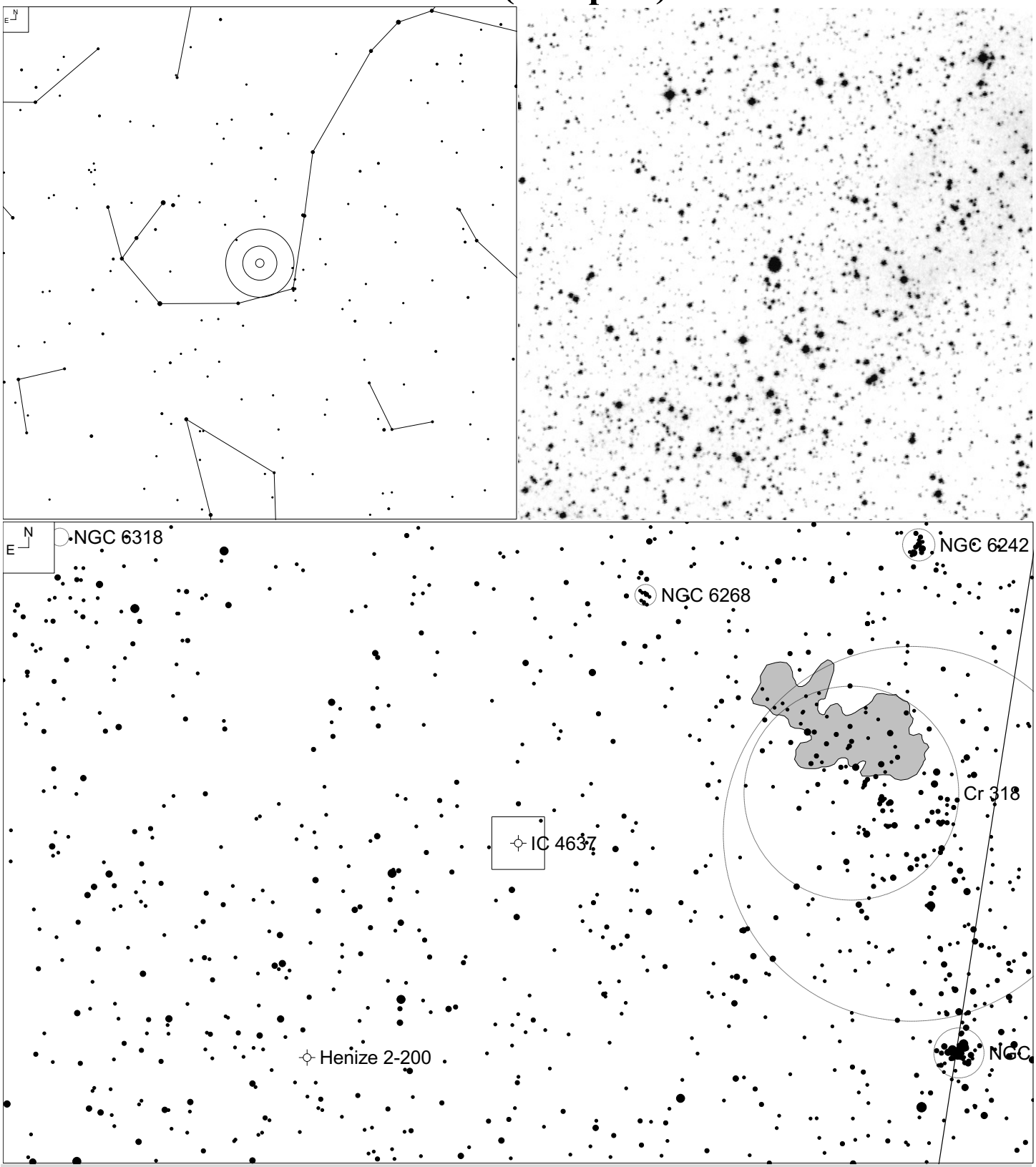
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG 7-32-40	15 37 13.3	+43 17 54	12.8	1.4’ X 0.9’	Sc / SASBcd	35	20

IC 4599 (Scorpius)



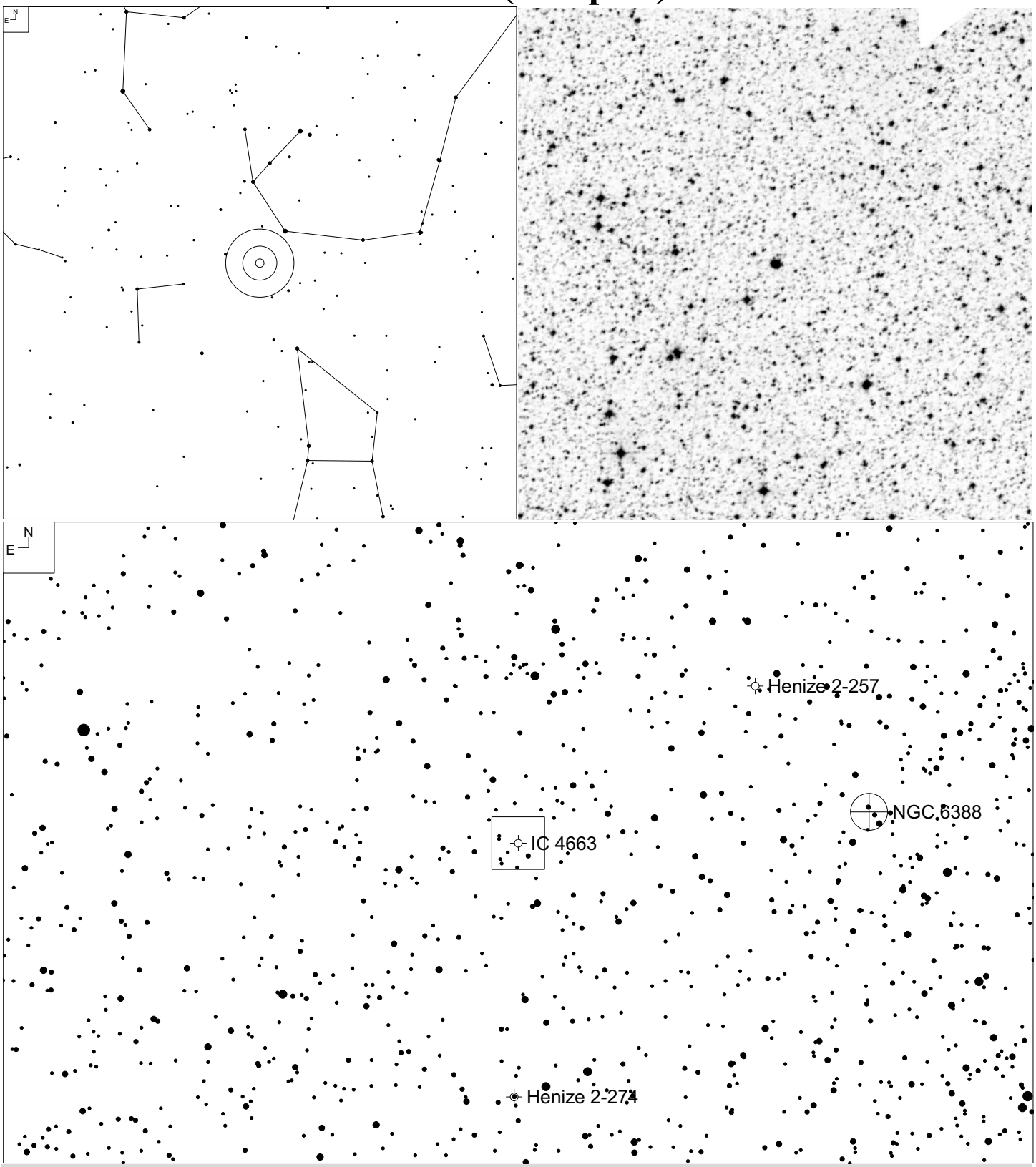
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
He 2-155	16 19 23.2	-42 15 37	12.3	15.0”	PN	182	91

IC 4637 (Scorpius)



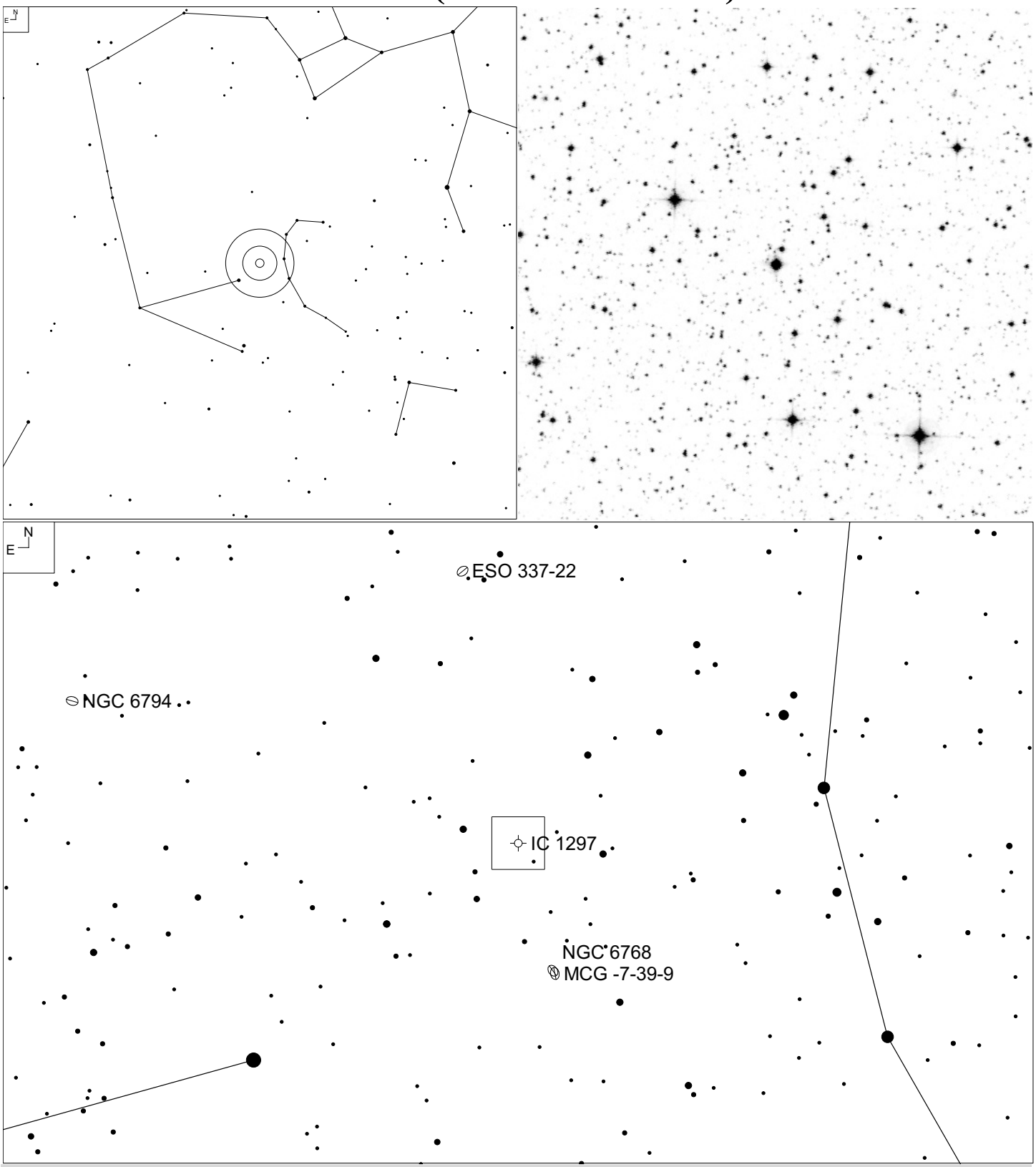
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
He 2-193	17 05 10.5	-40 53 08	12.5V	31.0”	III	181	91

IC 4663 (Scorpius)



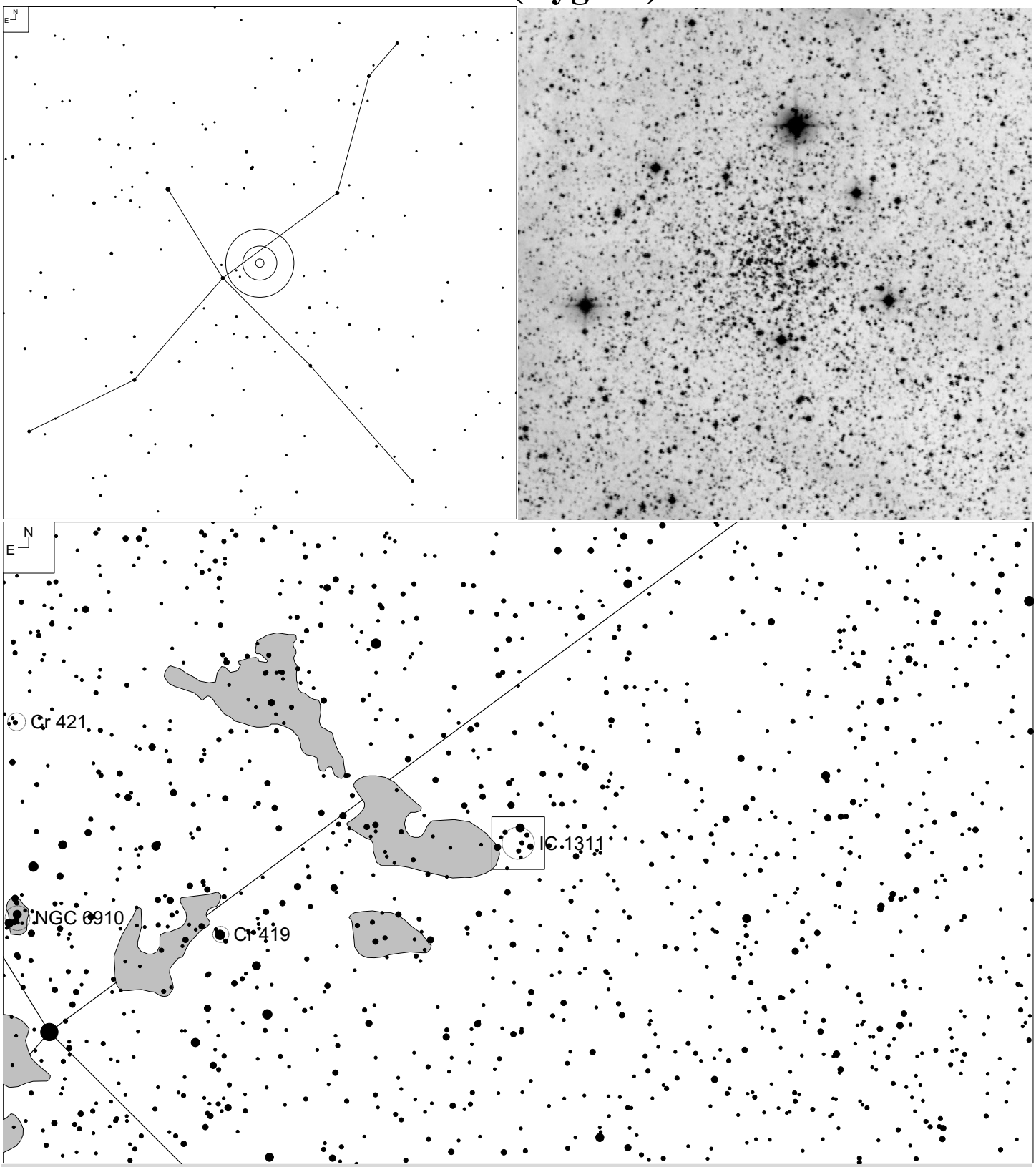
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
He 2-273	17 45 28.6	-44 54 18	12.5V	16.0”x 19.5”	IV	181	91

IC 1297 (Corona Australis)



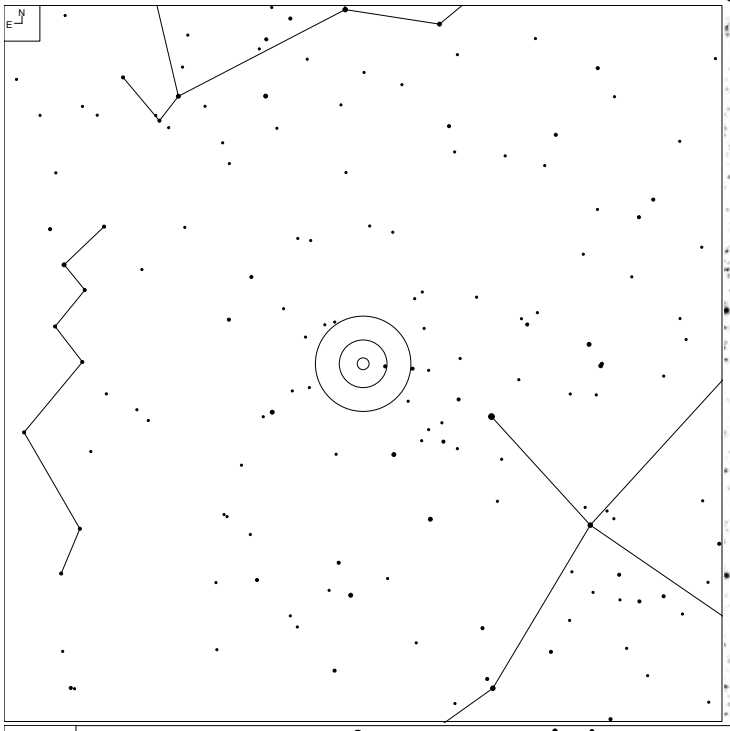
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
He 2-431	19 17 23.4	-39 36 46	10.89V	22.0”	?	163	90

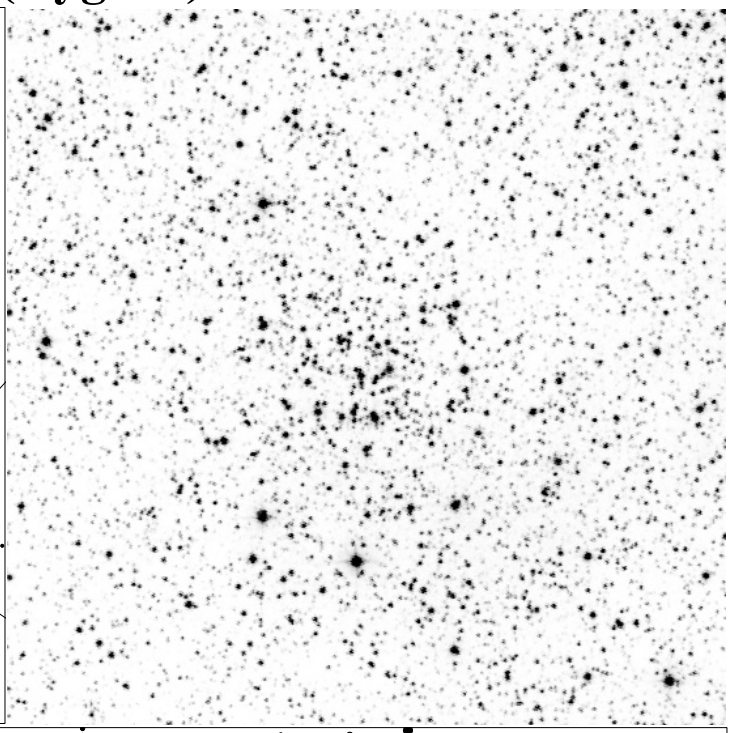
IC 1311 (Cygnus)

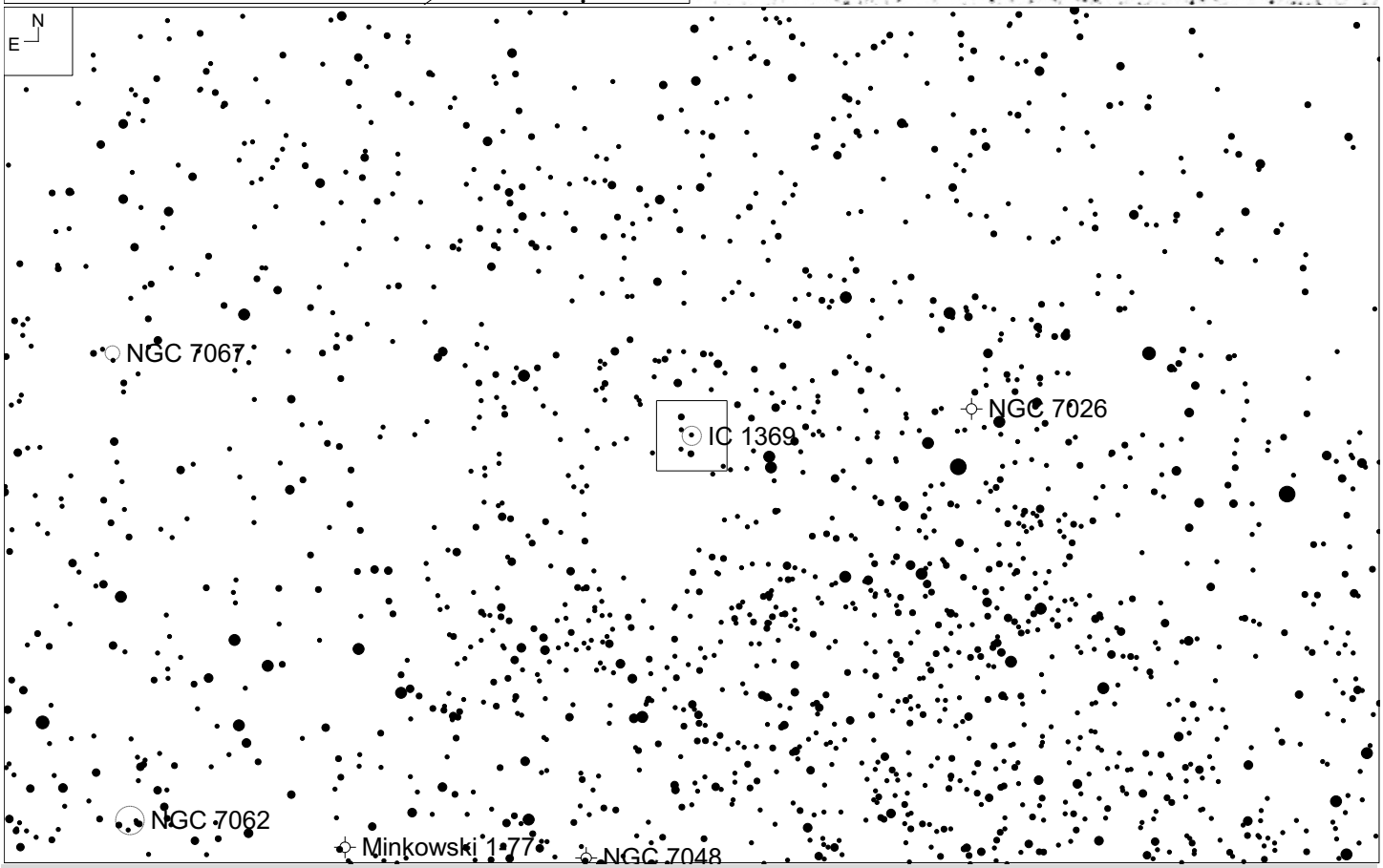


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Collinder 414	20 10 47.3	+41 10 37	9.9	9.0’ x 9.0’	I 1 r n	32	17

IC 1369 (Cygnus)







Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Collinder 432	21 12 07.9	+47 46 12	9.4	4.0’ x 4.0’	II 2 m	32	17

The Texas Star Party - Advanced Observing Program – 2023

"*WITHIN*"

The Advanced Observing Program was initiated to educate and challenge observers to locate and observe those objects they might have considered too difficult, if not impossible to find and/or see visually in what they may consider "too small a telescope". There is no better place to push the visual limit than under the dark transparent West Texas sky. Too often observers stop at the *"NGC Limit"* and never try to locate objects that begin with names like *Arakelian, Minkowski, Palomar or Sanduleak*. Such *Name Intimidation* is nothing more than becoming overwhelmed by the seemingly exalted difficulty of the object merely due to its unfamiliar or exotic name. A large telescope is NOT required to observe these objects.

The listed targets are best located and observed by careful and precise star-hopping. It is most imperative that the observer know *exactly* where in the field to look when the object is located, especially if some item turns out to be truly "light challenged" in their particular telescope. By using various magnifications and a combination of averted and direct vision along with a large degree of patience - usually the object will be seen. Give the sky a chance and it will come to you. The standard observing rule is if you think you see the object at least ***three times***, then you probably Really Did See It - Log it - and go on to the next object. First please refer to the handout for some information about the object. Knowing something about what you are viewing makes it a much more interesting discovery, since each is unique and has a story to tell.

Visual observers enjoy viewing Orion Nebula like objects in our own Milky Way galaxy, but how exciting is it to view similar objects in OTHER galaxies, millions of light years away. Some observers may consider this a futile excursion into the realm of science fiction, but with patience and a knowledge of where to look, it is certainly possible, even with moderate aperture telescopes. How often do we merely glimpse the bright galaxy Messier 101, but fail to note the bright star forming regions within the spiral arms? How often have we observed Messier 16, the Eagle nebula but failed to notice the "Star Queen" formation, made popular by the Hubble Space telescope? However, you do not need the HST to see this yourself, as it is visible in medium aperture telescopes. These objects require a lot of time, study and patience.

This year's advanced program highlights 40 interesting, sometimes bright and easily seen objects, but they all contain internal details viewable in amateur optics. In planning your observations, pay attention to both the listed magnitudes and the distances, which will give an indication of the surface brightness of the features within the main object. However, as we visual observers know, the only way to know for sure if something is visible, on that particular night and in that specific telescope, is to LOOK for yourself. Adopt the theory, that within reason anything may be seen, - Until you have visually proven otherwise.

Only one feature within any of the selected 20 objects (Out of 40) is required to obtain a 2023 Advanced Observing Pin. This year, if one fails to ascertain internal detail in an object, the observer is still rewarded with viewing one of the brightest gems in the night sky - a nice feature of this year's program Those of you who have successfully observed all of the previous 20 years programs, will also receive a very special TSP 20 year advanced anniversary T-shirt - while they last. As astronomers, we are privileged to view massive far-away objects that most people do not know even exists, and this year we get to view objects most observers have passed up. I urge you to try All of the objects, as you may be surprised at your accomplishments.

TSP Advanced Observing Pin - From The One and The Only - The TEXAS STAR PARTY.

1. Any telescope may be used or any combination of telescopes.
2. Location by Star Hopping is Preferred - The best way to know where an object is in the heavens is to go and find it. *"Star Hop and be Educated"*. Maybe next time you can locate it without a chart, from memory - Always the Best Way.
3. An Advanced Observing Pin will be awarded to those who observe any 20 of the listed objects during TSP.
4. Observation programs from previous years may be completed for appropriate pins.
5. Observations may be turned in to Larry Mitchell anytime during the Star Party.

To those of you who only complete part of the list, but who have worked hard at it, you have successfully completed the spirit of the program. You have improved your observing skills, learned something about the night sky and hopefully enjoyed yourself.... And you can always get that observing pin next year – I still have plenty. Many people have enthusiastically stated how amazed they were - at themselves - For observing these objects and with their own equipment.

◄ **EXPAND YOUR PERCEIVED OBSERVING LIMITS - THIS IS WHAT THE ADVANCED PROGRAM IS ALL ABOUT** ►

I hope you enjoy this challenge as much as I have in presenting it and that it gives you a new sense of Enjoyment and Confidence in your Abilities to Successfully View – With Your Own Eyes - Natures Grandest Arena Our Wonderful - Magnificent Universe.

Larry Mitchell
Chairman – TSP Advanced Observing Program – 2023

TSP Advanced Observing – 2023: *Observing WITHIN*!

Observe ANY Internal Feature (s) within 20 Objects – Receive a PIN

Name	*2ND Name*	*Type*	*Coordinates J2000*	*Const.*	*Mag.*	*Size*	**U-2*
NGC2366	**KISO 5639**	**Galaxy**	**07 28 51.9 +69 12 31**	**Cam**	**11.39(V)**	**8.2' x 3.3'**	**21**
☐ Markarian 71		H II	20"▲				
NGC2903	**UGC5079**	**Galaxy**	**09 32 10.1 +21 30 03**	**Leo**	**9.07(V)**	**12.6' x 6.0'**	**143**
☐ NGC2903 A		H II	20"▲/ 15"▼				
☐ NGC2903 B		H II	20"▲/ 15"▼				
☐ NGC2903 Arm		H II	20"▲/ 15"▲Fairly easily seen				
☐ NGC2905		H II	20"▲				
NGC2997	**UGCA 181**	**Galaxy**	**09 45 38.8 -31 11 27**	**Ant**	**9.41(V)**	**9.2' x 7.4'**	**365**
☐ NGC2997 A		H II	20"▲Stellar, Occasional				
☐ NGC2997 B		H II	20"▲Stellar				
☐ NGC2997 C		O.C.	20"▲				
Messier 82	**NGC3034**	**Galaxy**	**09 55 52.4 +69 40 47**	**UMa**	**8.41 (V)**	**11.3' x 4.2'**	**23**
☐ Dust Lane		Dust	20"▲Obvious /15"▲Fairly Easy				
☐ M82 A		O.C./SNR	20"▲Can separate A and B /15"▲Easy				
☐ M82 B		O.C./SNR	15"▲Easy				
☐ M82 C		O.C./SNR	20"▲Small /15"▲				
☐ M82 D		O.C./SNR	15"▲				
Sextans A	**PGC29653**	**Galaxy**	**10 11 00.5 -04 41 30**	**Sex**	**11.93(V)**	**5.7' x 5.1'**	**234**
☐ SF-A		O.C.	20"▲				
☐ Sex A-A		H II	20"▲				
☐ Sex A-B		H II	20"▲				
NGC3423	**UGC5962**	**Galaxy**	**10 51 14.3 +05 50 24**	**Sex**	**12.1(B)**	**3.8' x 3.2'**	**190**
☐ NGC3423 B		H II	20"▲Obvious Bump 318x, 254X				
☐ NGC3423 C		H II	20"▲				
☐ NGC3423 D		H II	20"▲Fleeting, 20% time 318x, 254X				
NGC3432	**UGC5986**	**Galaxy**	**10 52 31.1 +36 37 08**	**LMi**	**11.67(V)**	**6.8' x 1.4'**	**105**
☐ Nucleus		Core	20"▲Large and nebulous 318X				
☐ NGC3432 A		H II	20"▲318X				
☐ NGC3432 B		H II	20"▲318X				
NGC3448	**UGC6024**	**Galaxy**	**10 54 39.2 +54 18 19**	**UMa**	**12.2(B)**	**4.8' x 1.4'**	**46**
☐ Dust Lane Dust			15"▲Dust lane easy				
☐ NGC3448 A		H II	15"▲Pops in and out, averted vision				
NGC3627	**M66**	**Galaxy**	**11 20 15.0 +12 59 29**	**Leo**	**8.92(V)**	**9.1' x 4.1'**	**191**
☐ Dust Lane		Dust	20"▲Sharp side compared to opposite side / 15"▲Easy				
☐ NGC3627 A		H II	15"▲Difficult – Popped in and out				
☐ NGC3627 B		H II	20"▲Easy / 15"▲ Difficult – Popped in and out				
☐ NGC3627 C		H II	15"▲Difficult – Popped in and out				
☐ NGC3627 D		H II	20"▲Easy / 15"▲ Fairly Easy				

1.

Name	2ND Name	Type	Coordinates J2000	Const.	Mag.	Size	U-2
NGC3628	**UGC6350**	**Galaxy**	**11 20 17.0 +13 35 22**	**Leo**	**9.48(V)**	**14.8′ x 2.9′**	**191**
☐ Tidal Tail		Tidal Tail	25″▲Averted vision object / 15″▲Extremely Dim				
NGC3631	**UGC6360**	**Galaxy**	**11 21 02.9 +53 10 10**	**UMa**	**11.0(B)**	**5.0′ x 4.7′**	**46**
☐ NGC3631 A		H II	15″▲Difficult 216X				
☐ NGC3631 B		H II	20″▲Southern arm easily seen				
☐ NGC3631 E		Dust Ln.	15″▲Arm seen but not straight				
☐ Warped Arm		Arm					
NGC3893	**UGC6778**	**Galaxy**	**11 48 38.2 +48 42 39**	**UMa**	**10.67(V)**	**4.5′ z 2.7′**	**74**
☐ NGC3893 A		H II					
☐ NGC3893 B		Arm/H II	20″▲Arm and HII region easy 254x / 15″▲Difficult				
☐ NGC3893 C		H II	20″▲Easy 254X / Difficult				
NGC4027	**UGCA260**	**Galaxy**	**11 59 30.2 -19 15 55**	**Crv**	**11.10(V)**	**2.8′ x 2.5′**	**327**
☐ NGC4027 A		HII	20″▲				
☐ NGC4027 B		HII	20″▲				
☐ Tidal Tail		Tidal Tail	20″▲Obvious - Easy 318X / 15″▲ Difficult				
NGC4038	**Antennae**	**Galaxy**	**12 01 53.0 -18 52 03**	**Crv**	**10.9(P)**	**3.7′ x 1.7′**	**328**
NGC4039	**Antennae**	**Galaxy**	**12 01 53.8 -18 53 05**	**Crv**	**11.1(P)**	**4.0′ x 2.2′**	**328**
☐ NGC4038 A		O.C.	20″▲ / 15″▲Pops in and out				
☐ NGC4038 B		O.C.	20″▲ / 15″▲Pops in and out				
☐ NGC4038 C		H II	20″▲ / 15″▲Pops in and out				
☐ NGC4038 D		H II	20″▲ / 15″▲Pops in and out				
☐ NGC4038 E		H II	20″▲Easy / 15″▲Pops in and out				
☐ NGC4038 F		H II	20″▲Separate from G /15″▲Pops in and out				
☐ NGC4038 G		H II	20″▲Separate from E /15″▲Pops in and out				
☐ NGC4038 H		H II	20″▲Easy 20-inch				
☐ NGC4038 Core		Nucleus	20″▲Easy				
☐ NGC4039 Core		Nucleus	20″▲Easy				
☐ NGC4039 A		H II	20″▲Easy				
NGC4051	**UGC7030**	**Galaxy**	**12 03 09.6 +44 31 53**	**UMa**	**12.92(V)**	**5.2′ x 4.6′**	**74**
☐ NGC4051 A		H II	15″▲Easy				
☐ NGC4051 B		H II	15″▼				
☐ NGC4051 C		H II	15″▲Easy				
☐ Sy 1 Nucleus		Nucleus	20″▲Easy / 15″▲ Easy				
NGC4178	**IC3042**	**Galaxy**	**12 12 46.4 +10 51 58**	**Vir**	**12.9(B)**	**5.1′ x 1.8′**	**193**
☐ NGC4178 A		H II	20″▲Easy – Seen as one elongated object				
☐ NGC4178 B		H II	20″▲Easy – Seen as one elongated object				
☐ NGC4178 C		H II	20″▲Blends with halo, seen as an arm extension				
NGC4214	**NGC4228**	**Galaxy**	**12 15 39.2 +36 19 37**	**CVn**	**9.93(V)**	**7.4′ x 6.5′**	**107**
☐ NGC4214 A		Core	20″▲Brightest area / 15″▲				
☐ NGC4214 B		H II	20″▲Easy / 15″▲				
☐ NGC4214 D		H II	20″▲Easy Large / 15″▲fairly easy				
☐ NGC4214 E		H II	15″▲Near stellar				

Name	2ND Name	Type	Coordinates J2000	Const.	Mag.	Size	U-2
NGC4254	**Messier 99**	**Galaxy**	**12 18 49.6 +14 24 59**	**Com**	**9.87(V)**	**5.4′ x 4.7′**	**193**
☐ NGC4254 A		H II	20″▲				
☐ NGC4254 D		H II	20″▲Seen 20% of time				
☐ NGC4254 E		H II	20″▲				
☐ Prominent Arm		Arm	20″▲Easy				
NGC4438	**UGC7574**	**Galaxy**	**12 27 45.7 +13 00 32**	**Vir**	**10.17(V)**	**8.6′ x 3.1′**	**193**
☐ Tidal Tail		Tidal Tail	20″▲Easy / 15″▲ easy				
☐ Dust Lane		Dust	20″▲Nucleus shifted to the west / 15″▲ easy				
NGC4449	**UGC7592**	**Galaxy**	**12 28 11.1 +44 05 37**	**CVn**	**9.64(V)**	**6.1′ x 4.3′**	**75**
☐ Nucleus Star Cluster		O.C.	20″▲ /15″▲Easy				
☐ NGC4449 A		H II	20″▲ / 15″▲Easy				
☐ NGC4449 B		H II	20″▲ / 15″▲Easy				
☐ NGC4449 C		H II	20″▲ / 15″▲Easy				
☐ NGC4449 D		H II					
☐ NGC4449 G		H II	20″▲ / 15″▲G & H Look like one object				
☐ NGC4449 H		H II	20″▲ / 15″▲				
NGC4485	**UGC7648**	**Galaxy**	**12 30 31.1 +41 42 04**	**CVn**	**11.93(V)**	**2.6′ x 1.9′**	**75**
NGC4490	**UGC7651**	**Galaxy**	**12 30 36.4 +41 38 37**	**CVn**	**9.79(V)**	**6.3′ x 2.7′**	**75**
☐ NGC4485 A		H II					
☐ NGC4485 B		H II					
☐ NGC4590 A		H II					
☐ NGC4490 B		H II					
☐ NGC4490 C		H II					
NGC4559	**UGC7766**	**Galaxy**	**12 35 57.6 +27 57 36**	**Com**	**10.01(V)**	**10.8′ x 4.3′**	**149**
☐ NGC4559 A		H II					
☐ NGC4559 B		H II					
☐ NGC4559 C		H II					
☐ NGC4559 D		H II					
☐ IC3551		H II					
☐ IC3552		H II					
NGC4631	**Arp 281**	**Galaxy**	**12 42 08.0 +32 32 29**	**CVn**	**9.19(V)**	**15.4′ x 2.6′**	**108**
☐ NGC4631 B		H II	20″▲Faint / 15″▼				
☐ NGC4631 C		H II	20″▲Largest / 15″▲				
☐ NGC4631 D		H II	20″▲ / 15″▼				
☐ NGC4631 E		H II	20″▲ / 15″Maybe ?				
☐ NGC4631 F		H II	20″▲Seen as a ridge / 15″▲				
☐ NGC4631 G		H II	20″▲Brightest, most pronounced / 15″▲				
NGC4656	**UGC7907**	**Galaxy**	**12 43 57.6 +32 10 13**	**CVn**	**10.52(V)**	**9.1′ x 1.7′**	**108**
☐ NGC4656 A		H II	20″▲20% of the time				
☐ NGC4656 D		H II	20″▲Seen as two objects				
☐ NGC4656 E		H II	20″▲				
Messier 64	**NGC4826**	**Galaxy**	**12 56 43.7 +21 40 58**	**Com**	**8.52(V)**	**10.1′ x 5.4′**	**149**
☐ NGC4826 A			O.C.				

Name	2ND Name	Type	Coordinates J2000	Const.	Mag.	Size	U-2
NGC4861	**IC3691**	**Galaxy**	**12 59 02.3 +34 51 34**	**CVn**	**12.32(V)**	**4.2′ x 1.5′**	**108**
☐ 1 Zw 49		H II	20″▲Spectacular - Knot has dimension				
M51	**NGC5194**	**Galaxy**	**13 29 52.7 +47 11 43**	**CVn**	**8.36 (V)**	**10.3′ x 8.1′**	**76**
☐ NGC5194 A		H II	20″▲				
☐ NGC5194 B		H II	20″▲				
☐ NGC5194 C		H II	20″▲				
M83	**NGC5236**	**Galaxy**	**13 37 00.9 -29 51 57**	**Hya**	**7.52(V)**	**12.8′ x 11.4′**	**370**
☐ NGC5236 B		H II					
☐ NGC5236 C		H II	20″▲Visually nice				
☐ NGC5236 E		H II					
☐ NGC5236 F		H II					
NGC5398	**UGCA379**	**Galaxy**	**14 01 21.6 -33 03 50**	**Cen**	**12.39(V)**	**2.8′ x 1.6′**	**371**
☐ NGC5398 A		H II	20″▲Subtle brightening				
Messier 101	**NGC5457**	**Galaxy**	**14 03 12.6 +54 20 56**	**UMa**	**7.86(V)**	**28.9′ x 26.9′**	**49**
☐ NGC5447/5450		H II	20″▲Visually elongated				
☐ NGC5449		H II					
☐ NGC5451		H II					
☐ NGC5453		H II	20″▲Visually small & faint				
☐ NGC5455		H II	20″▲Visually faint, stellar center				
☐ NGC5458		H II	20″▲Visually diffuse, large				
☐ NGC5461		H II	20″▲Visually easy				
☐ NGC5462		H II	20″▲Visually easy				
☐ NGC5471		Galaxy?	20″▲Visually different, easy & small				
NGC5595	**VV530**	**Galaxy**	**14 24 13.2 -16 43 23**	**Lib**	**12.6(B)**	**2.2′ x 1.2′**	**287**
☐ NGC5595 A		H II					
☐ NGC5595 B		H II					
☐ Arm		Arm	20″▲Galaxy arm brighter on the northern side				
NGC5829	**Arp 42**	**Galaxy**	**15 02 42.0 +23 20 01**	**Boo**	**14.14(B)**	**1.5′ x 1.0′**	**153**
☐ NGC5829 A			H II				
☐ NGC5829 B			H II				
JaFu 1	**Palomar 6**	**Pl. Neb**	**17 43 57.4 -26 11 47**	**Sgr**	**--**	**8.0″**	**338**
☐ JaFu 1		P.N.					
TC-20	**M20-Trifid**	**Dk Neb**	**18 02 29.3 -23 03 48**	**Sgr**	**--**	**26″ x 36″**	**339**
☐ TC2-Cometary globule		Com Glob	20″▲Black on black background				
The Dragon, M8- Lagoon Neb			**18 04 48.4 -24 29 30**	**Sgr**	**--**	**50′ x 40′**	**339**
☐ The Dragon		Bok Glob	20″▲Black on black background				
☐ Barnard 89		Dk Neb	20″▲Black on black background				
Pillars of Creation - M16		**Dk Neb**	**18 18 50 -13 50 01**	**Ser**	**--**	**1.4′ x 1.2′**	**294**
☐ Pillars of Creation		Bok Glob	15″▲Black on black background				
GJJC 1	**Messier 22**	**Pl. Neb**	**18 36 22.8 -23 55 18**	**Sgr**	**--**	**9.0″**	**340**
☐ GJJC 1	PK9-7.1	P.N.	20″▲Very Small				

Name	2ND Name	Type	Coordinates J2000	Const.	Mag.	Size	U-2
NGC6822	**Barnard Gal.**	**Galaxy**	**19 44 56.2 -14 47 51**	**Sgr**	**8.1(V)**	**15.6′ x 13.5′**	**297**
☐ Hubble IV		H II/OB A.	15″▲				
☐ Hubble VII		G.C.	15″▲				
☐ Hubble X	IC1308	H II/OB A.	15″▲				
☐ SC 6		G.C.	15″▲				
☐ SC 7		G.C.	15″▲				
Pease 1	**Messier 15 Pl. Neb.**		**21 29 59.4 +12 10 28**	**Peg**	**14.1 (V)**	**1.0″**	**210**
☐ Pease 1		P.N.	20″▲Responds to filter				
NGC7448	**Arp 13**	**Galaxy**	**23 00 03.6 +15 58 49**	**Peg**	**11.6(V)**	**2.5′ x 1.2′**	**213**
☐ NGC7448 A		H II					
☐ NGC7448 B		H II					

Observation Notes:

15-inch, f/4.5 telescope – Amelia Goldberg
20-inch, f/5.0 telescope – Larry Mitchell
25-inch f/5.0 telescope – Keith Rivich (K-2)

▲ – Successful Observation
▼ – Un-Successful Observation
Bok Glob – Bok Globule
Com Glob – Cometary Globule
Dk Neb – Dark Nebula
G.C. – Globular Cluster
H II – H II Region
O.C. – Open Cluster
OB A. – OB Stellar Association
P.N. – Planetary Nebula
SNR – Supernova Remnant

***U2 – "Uranometria 2000.0", Volume 1 - Reference Page Number**

Good Luck

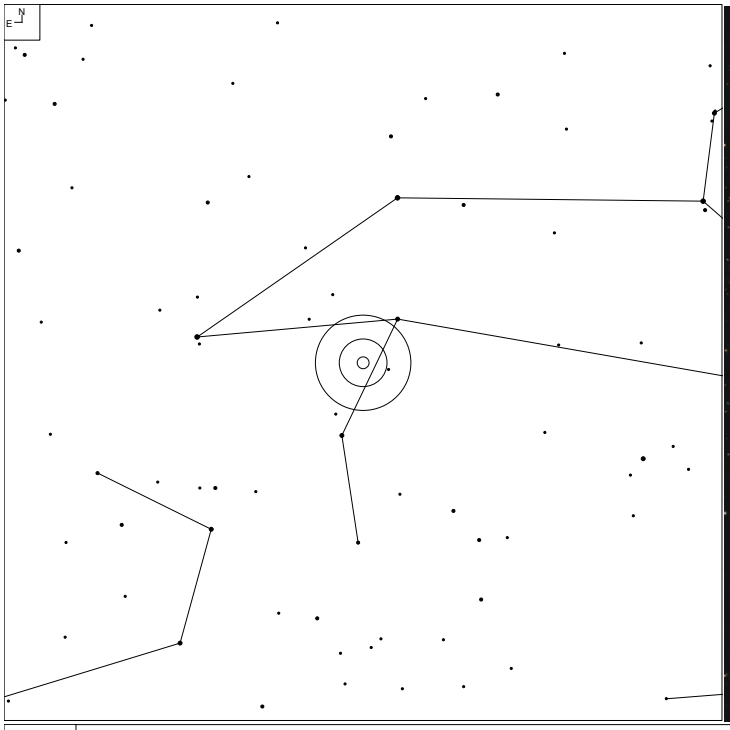
Larry Mitchell
T.S.P. Advanced Observing – 2023

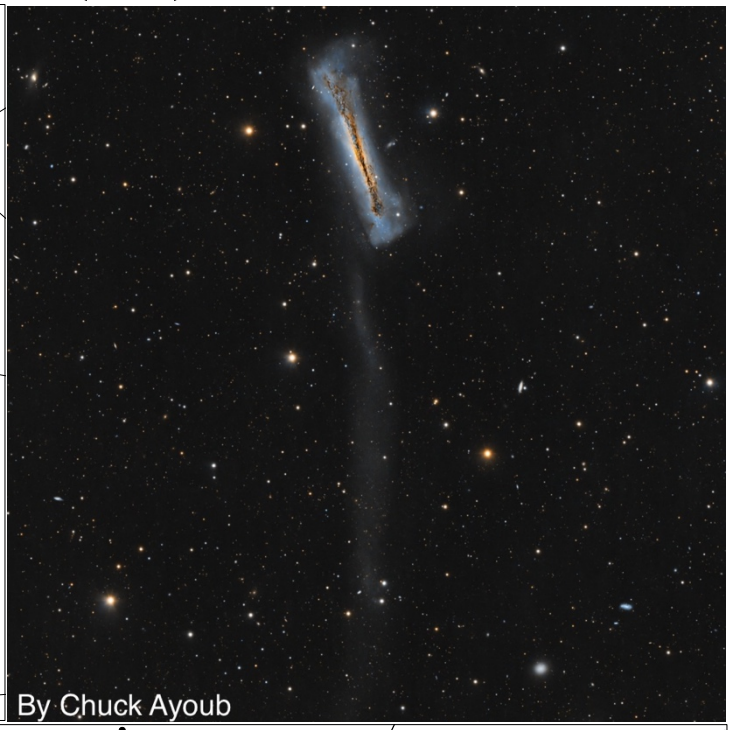
Most of the objects listed in this AO are in my recently released *Extragalactic Objects Within Host Galaxies*. See table below for a cross reference and page numbers.

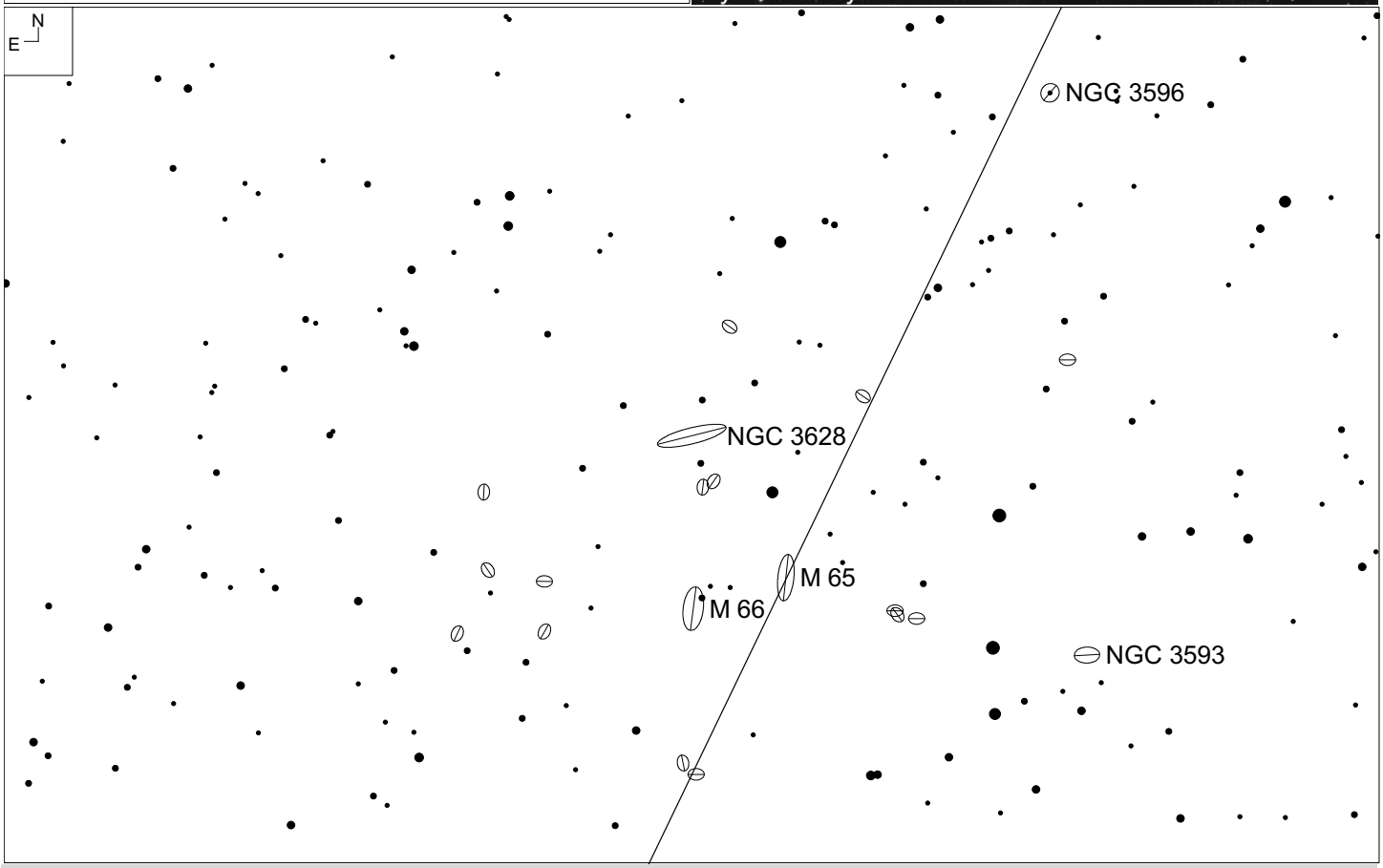
Page	Guide	Object	Page	Guide	Object
116	EOHG	NGC 2366	218	EOHG	NGC 4485/90
240	EOHG	NGC 2903	258	EOHG	NGC 4559
134	EOHG	NGC 2997	222	EOHG	NGC 4631
148	EOHG	NGC 3034. M82	224	EOHG	NGC 4656
86	LG	Sextans A	-	See below	NGC 4826 M64
298	EOHG	NGC 3423	226	EOHG	NGC 4861
238	EOHG	NGC 3432	232	EOHG	NGC 5194. M51
158	EOHG	NGC 3448	304	EOHG	NGC 5236. M83
248	EOHG	NGC 3627. M66	316	EOHG	NGC 5398
-	See below	NGC 3628	186	EOHG	NGC 5457. M101
162	EOHG	NGC 3631	-	See below	NGC 5595
168	EOHG	NGC 3893	-	See below	NGC 5829
308	EOHG	NGC 4027	157	GC	JaFu 1
310	EOHG	NGC 4038/39	-	See below	M20
174	EOHG	NGC 4051	-	See below	M8
262	EOHG	NGC 4178	-	See below	M16
210	EOHG	NGC 4214	155	GC	GJJC1
254	EOHG	NGC 4254	71	LG	NGC 6822
268	EOHG	NGC 4438	154	GC	Pease 1
216	EOHG	NGC 4449	24	EOHG	NGC 7448

Page references with my other guides available on my website.
EOHG – Extragalactic Objects Within Host Galaxies
LG – Observing the Local Group
GC – Observing the Milky Way Globular Clusters

NGC 3628 (Leo)

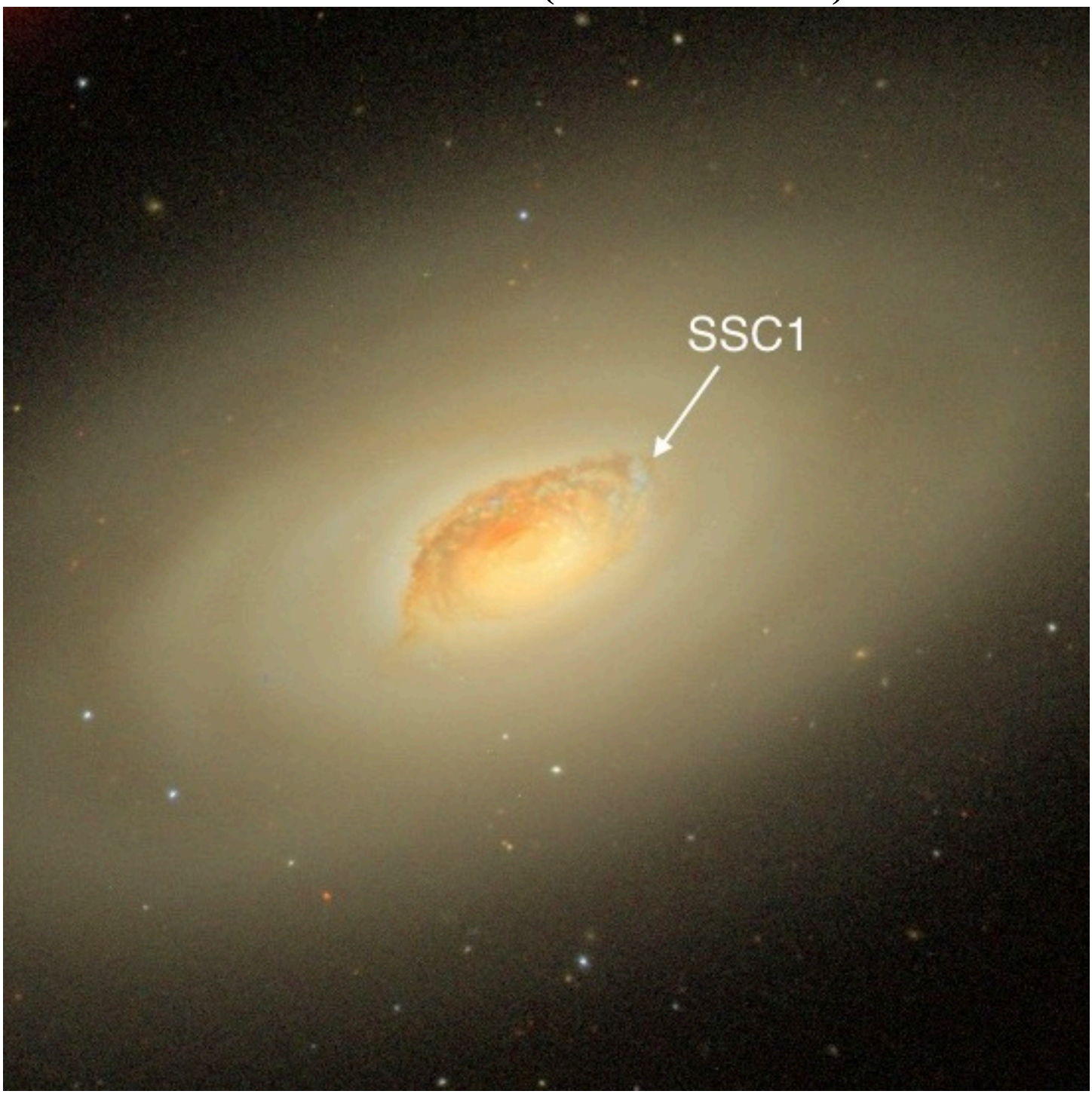






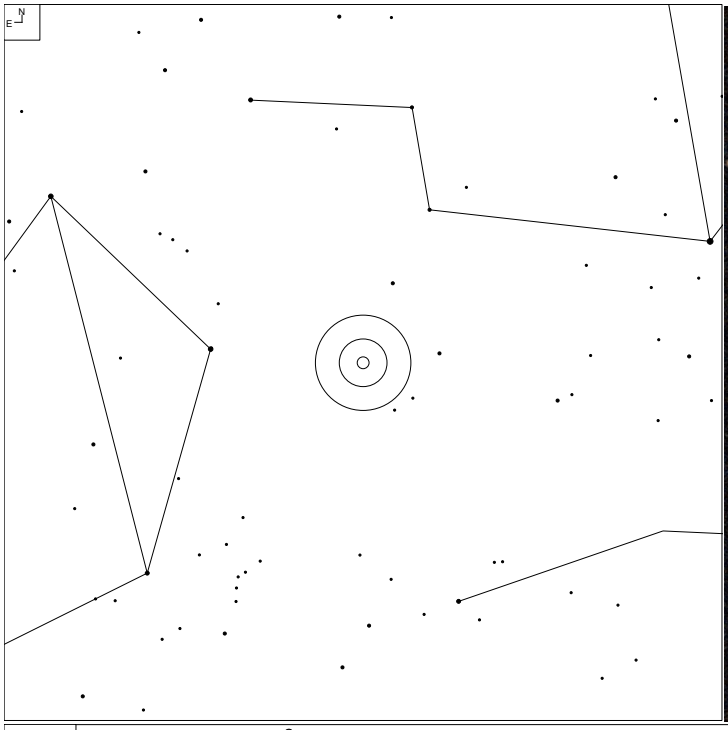
Object	RA	Dec	Mag	Size	Urano 2	iDSA
NGC 3628 Tidal Tail	11 20 17.0	+13 35 22	9.48v	14.8 x 2.9’	92	46

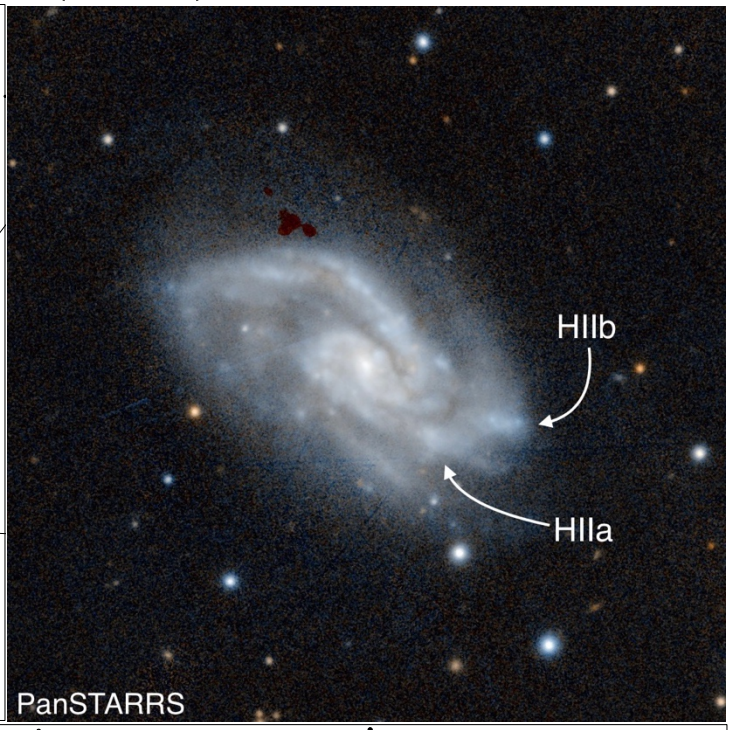
NGC 4826 M64 (Coma Berenices)

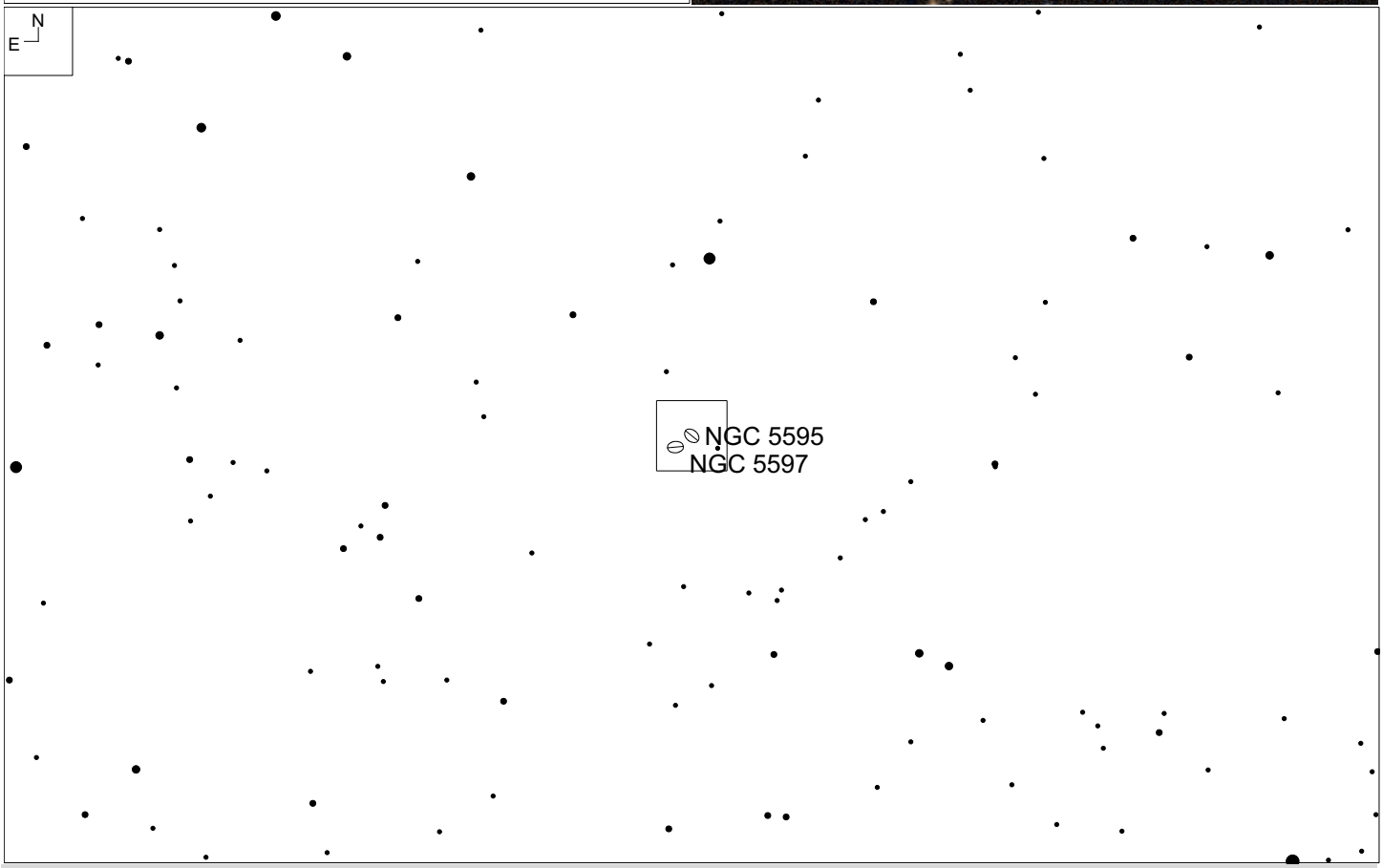


Object	RA	Dec	Mag	Size	Urano 2	iDSA
NGC 4826	12 56 43.7	+21 40 58	8.52v	10.1 x 5.4’	71	45
SSC1	12 56 40.9	+21 41 24				

NGC 5595 (Libra)

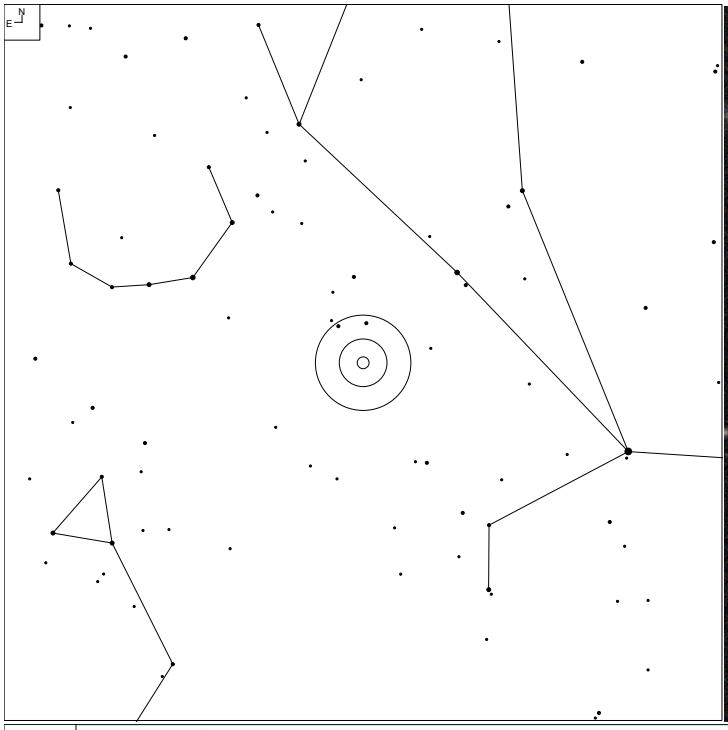


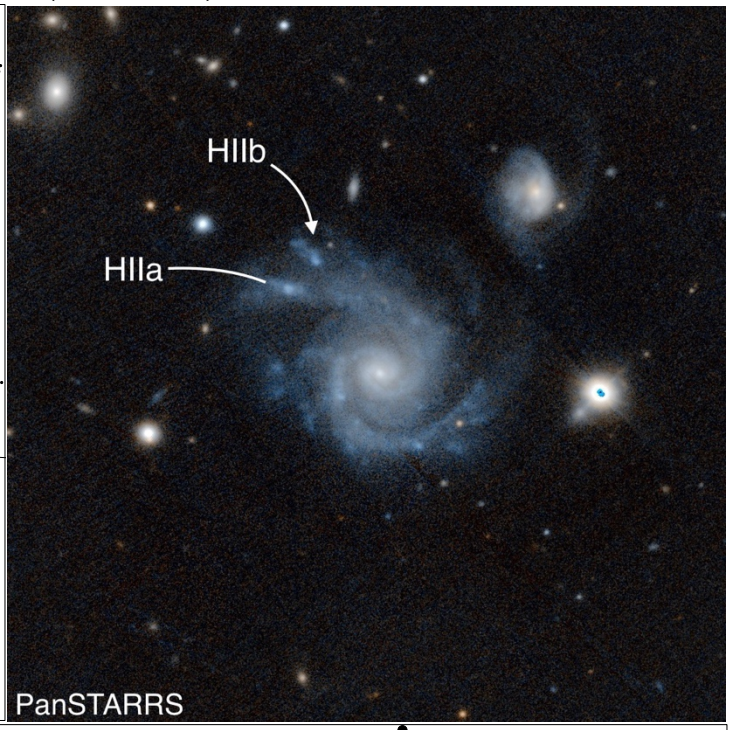


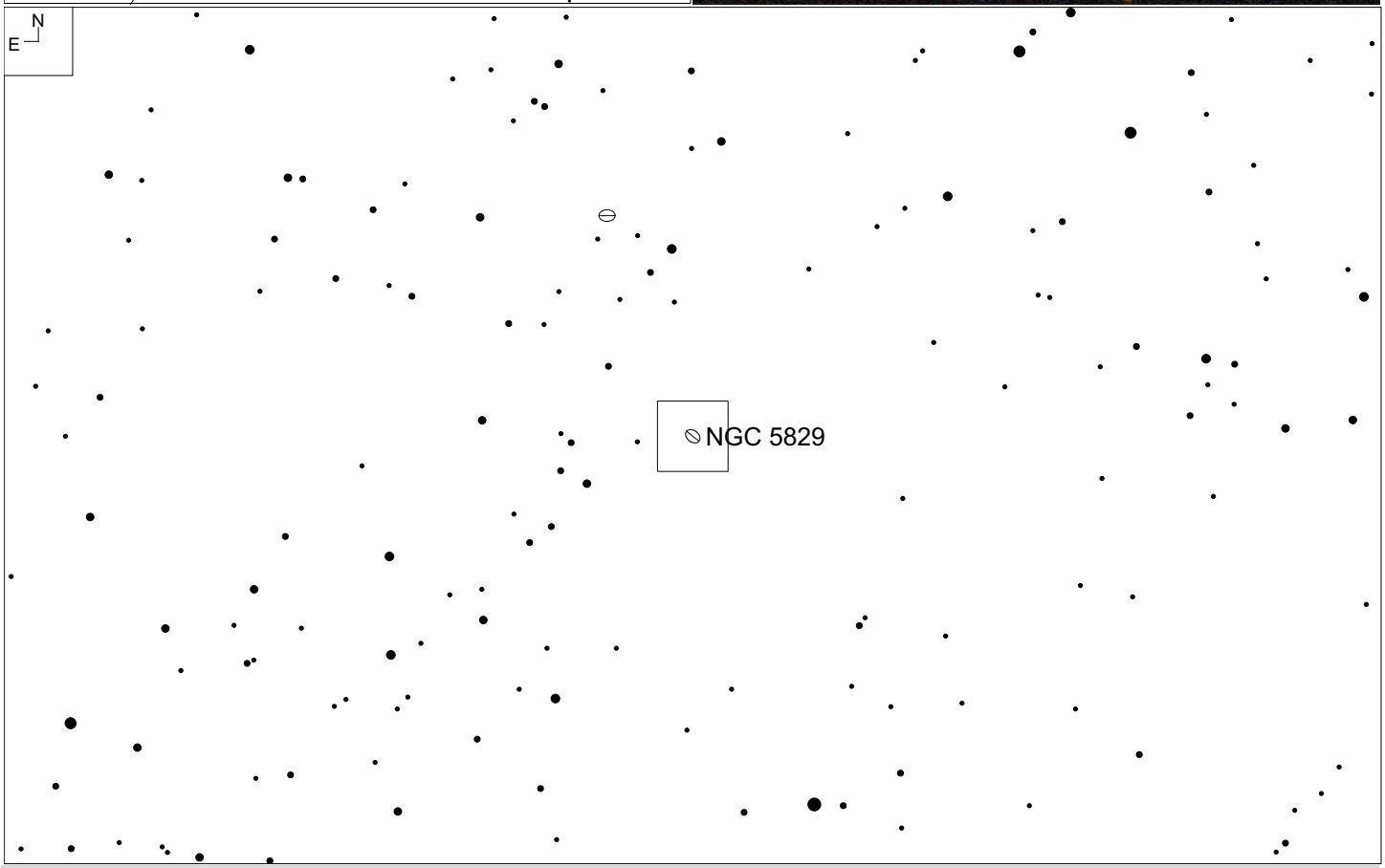


Object	RA	Dec	Mag	Size	Urano 2	iDSA
NGC 5595	14 24 13.2	-16 43 23	12.6g	2.2 x 1.2’	129	68
H IIa	14 24 12.1	-16 43 41				
H IIb	14 24 10.9	-16 43 38				

NGC 5829 (Boötes)

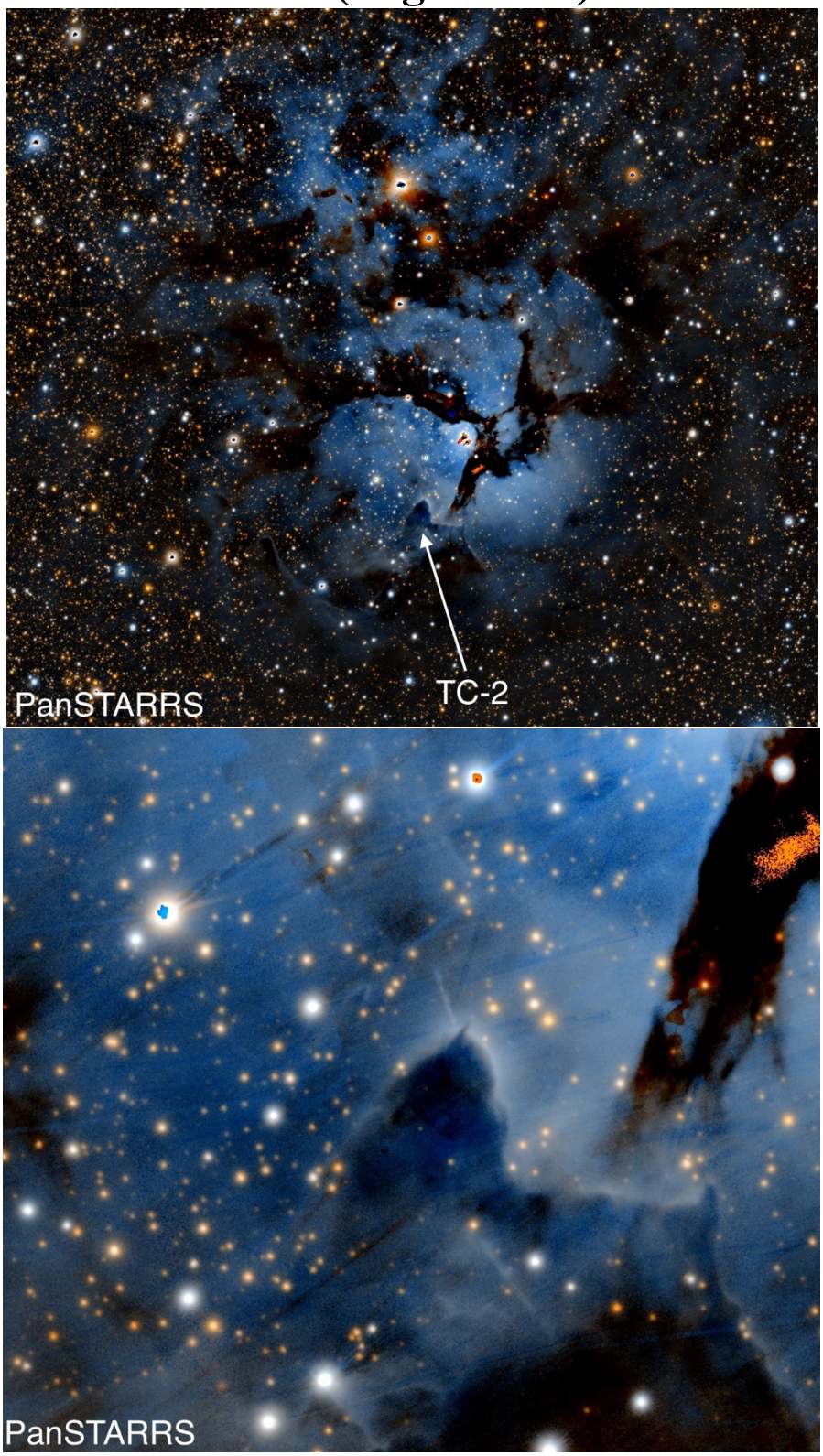






Object	RA	Dec	Mag	Size	Urano 2	iDSA
NGC 5829	15 02 42.0	+23 20 01	14.14b	1.5 x 1.0’	70	32
H IIa	15 02 44.2	+23 20 29				
H IIb	15 02 43.6	+23 20 39				

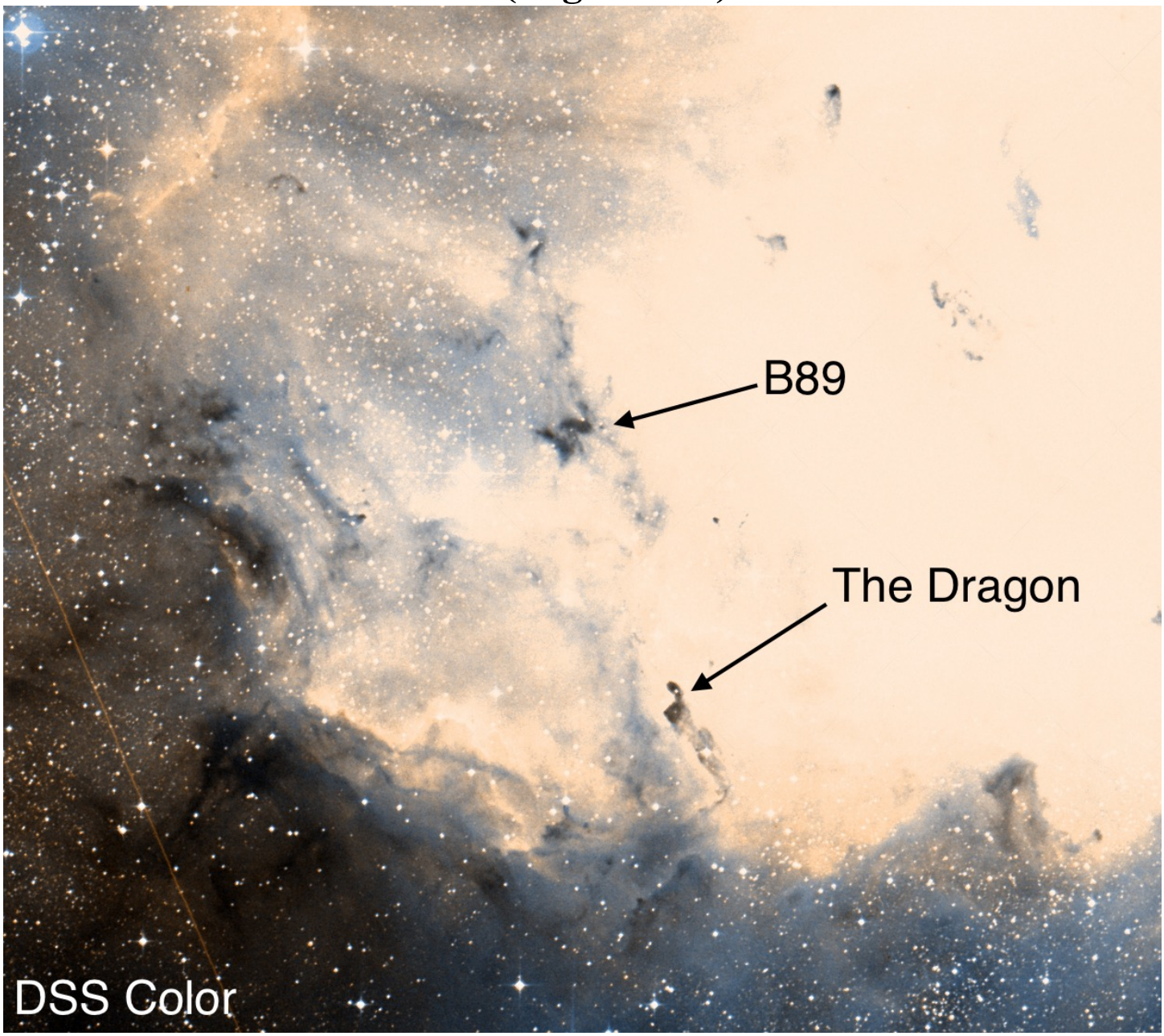
M20 (Sagittarius)



Object	RA	Dec	Mag	Size	Urano 2	iDSA
TC-2	18 02 28.8	-23 03 56		26 x 36”	145	78, D6

See Jeonghee Rho, Bertrand Lefloch, et al. “M20: Star Formation in a Young HII Region” in *Handbook of Star Forming Regions, Vol II, Astronomical Society of the Pacific*, 2008

M8 (Sagittarius)



Object	RA	Dec	Mag	Size	Urano 2	iDSA
The Dragon	18 04 45.7	-24 30 24			145	78, D6
Barnard 89	18 04 57.9	-24 22 38				

M16 (Serpens)

Object	RA	Dec	Mag	Size	Urano 2	iDSA
Pillars of Creation	18 18 50	-13 50 01		1.4 x 1.2’	126	66

Total Solar Eclipse – 2024 – Latham Springs, Texas
Telescope Observing Program

ITEM	COORDINATES - J2000	TYPE	CONST.	MAG.	SIZE	DISTANCE
NGC3242(Ghost/Jupiter)	10h 24m 46.2s -18° 38′ 32″	P.N.	Hya	12.15 (V)	75.0″	2,800 LYrs
NGC4088	12h 05m 34.2s +50° 32′ 21″	Gal.	Uma	11.2 (B)	5.3′x2.1′	46.5 MLYrs
NGC4214 (NGC4228)	12h 15m 39.6s +36° 19′ 34″	Gal.	CVn	9.93 (V)	7.4′x6.5′	19.2 MLYrs
NGC4302/NGC4298	12h 21m 42.5s +14° 35′ 52″	Gal.	Com	11.6 (V)	5.8′X0.7′	55 MLYrs
NGC4216	12h 15m 54.4s +13° 08′ 58″	Gal.	Vir	10.01 (V)	8.7′x1.7′	9.2 MLYrs
NGC4361 (PK294+43.6)	12h 24m 30.8s -18° 47′ 06″	P.N.	Crv	13.2 (V)	118.0″	3,912 LYrs
NGC4438 (Arp 120)	12h 27m 45.7s +13° 00′ 31″	Gal.	Vir	10.2 (V)	8.6′ X 3.1′	4.2 MLYrs
NGC4449	12h 28m 11.1s +44° 05′ 37″	Gal.	CVn	9.64 (V)	6.1′x4.3′	13.6 MLYrs
NGC4490	12h 30m 34.5s +41° 38′ 26″	Gal.	CVn	9.79 (V)	6.3′x2.7′	25 MLYrs
Brosch 1	12h 33m 19.5s -00° 38′ 52″	Ast	Vir	10.9 (V)	1.0′x 1.0′	--
NGC4559	12h 35m 57.6s +27° 57′ 36″	Gal.	Com	10.01 (V)	10.8′x4.3′	29.0 MLYrs
NGC4565	12h 36mc20.8s +25° 59′ 15″	Gal.	Com	12.43 (V)	15.9′x1.8′	42.7 MLYrs
NGC4605	12h 39m 59.3s +61° 36′ 33″	Gal.	UMa	10.94 (B)	5.7′x2.1′	18.1 MLYrs
NGC4631/NGC4627	12h 42m 08.0s +32° 32′ 29″	Gal.	CVn	9.19 (V)	15.4′x2.6′	30.0 MLYrs
NGC4636	12h 42m 49.8s +02° 41′ 16″	Gal.	Vir	11.84 (V)	6.0′x4.6′	59.6 MLYrs
NGC5466	14h 05m 27.3s +28° 32′ 04″	G.C.	Boo	9.70 (V)	9.0′x9.0′	51,800 LYrs
Napoleon's Hat	14h 14m 55.s7 +18° 31′ 18″	Ast.	Boo	9.4	20.8′x7.5′	--
NGC5634	14h 29m 37.3s -05° 58′ 35″	G.C.	Vir	10.05 (V)	5.5′x5.5′	82,200 LYrs
NGC5676	14h 32m 46.9s +49° 27′ 28″	Gal.	Boo	11.7 (B)	4.0′x1.9′	137.6MLYrs
NGC5907	15h 15m 53.7s +56° 19′ 44″	Gal.	Dra	11.4 (B)	12.9′x1.3′	55.4 MLYrs
NGC5897	15h 17m 24.4s -21° 00′ 36″	G.C.	Lib	8.52 (V)	11.0′x11.0′	40,750 LYrs
NGC6210	16h 44m 29.5s +23° 47′ 59″	P.N.	Her	11.7 (V)	30.0″	5,550 LYrs
NGC6242	16h 55m 36.0s -39° 28′ 00″	O.C.	Sco	8.2 (V)	25.8′X25.8	3,325 LYrs
NGC6284	17h 04m 28.7s -24°45′ 51″	O.C.	Oph	7.43 (V)	6.2′x6.2′	49,225 LYrs
NGC6302 (The Bug)	17h 13m 44.5s -37° 06′ 11″	P.N.	Sco	12.8 (P)	85.0″x44.0″	3,400 LYrs
NGC6369 (Little Ghost)	17h 29m 20.5s -23° 45′ 35″	P.N.	Oph	12.9 (P)	38.0″x38.0″	5,053 LYrs
NGC6520/Barnard 86	18h 03m 25.4s -27° 53′ 02″	O.C	Sgr	7.6 (V)	6.0′X6.0′	6,520 LYrs

Good Luck and Clear Skies -

Larry Mitchell

Ast. - Asterism
Gal. – Galaxy
G.C. – Globular Cluster
O.C. – Open Cluster
P.N. – Planetary Nebulae

Note: This list was included for the sake of completeness. No charts were generated as all of the objects are easy and you can find them yourself with any atlas.

The Texas Star Party - Advanced Observing Program – 2025

"A Little Bit of Everything"

As astronomers we are incredibly fortunate. We live in a fascinating, observable universe and every time a large telescope is aimed at an object, we learn something new, which is unprecedented among the sciences. Edwin Hubble, Alan Sandage, and many others would love to exchange places with amateurs like us simply because we are on the cutting edge of the science. As observers, we are privileged to view massive far-away objects that most people do not know even exists, and this year, as usual, we get to view objects most observers have passed up. This year's Advanced Program incorporates various types of items which are visible in telescopes of moderate to large apertures, and some will challenge even the most advanced observers.

The Advanced Observing Program was initiated to educate and challenge observers to locate and observe unfamiliar, extraordinary objects. Every object in the universe is unique and has a very interesting story to tell. There is no better place to push the visual limit than under the dark transparent West Texas sky. Too often observers stop at the *"NGC Limit"* and never try to locate objects that begin with names like *Arakelian, Minkowski, Palomar or Sanduleak*. Such *Name Intimidation* is nothing more than becoming overwhelmed by the seemingly exalted difficulty of the object merely due to its unfamiliar or exotic name. A large telescope is NOT required to observe most of these objects, and this year about 30 objects are visible in small to moderate sized instruments.

Visual observers often enjoy bright, easily seen deep-sky objects, but how exciting is it to view similar objects in OTHER galaxies, millions of light years away. Some may consider this a futile excursion into the realm of science fiction, but with patience and a knowledge of where to look, it is certainly possible, with telescopes of any aperture. How often do we merely glimpse the bright galaxy Messier 101, but fail to note the bright specific H II regions within the spiral arms, nine of which are NGC objects. How often have we observed Messier 16, the Eagle nebula but failed to notice the "Star Queen" formation, made popular by the Hubble Space telescope (HST) which is visible in medium aperture telescopes, with patience and study.

The TSP listed targets are best located and observed by careful and precise star-hopping. If the target is truly light challenging it is most imperative that the observer know *EXACTLY* where in the field of view (FOV) to look. This is best accomplished by star-hoping to the object. Now the observation becomes a simple "Do I see it" or "Do I not see it." Additionally, you know where in the sky you are looking, rather than 'just up', and maybe the next time you can locate the object without a chart, from memory - Always the Best Way. *"Star Hop and be Educated."*

A few Visual Observing Hints:

1.) Use various magnifications and plenty of averted and direct vision viewing
2.) Embrace a large dose of Patience – Patience - Patience. Let the sky come to you, and it usually does.
3.) If the object is truly light challenging and you think you see it 3-times, you probably did. Log it and go to the next object.
4.) Use a black cloth head covering so that the only light that reaches the face comes from the eyepiece field of view.
5.) It helps to slightly jiggle the telescope as often a moving object jumps out.
6.) A photograph of the object is helpful and indicates internal or external objects that may be visually missed otherwise.
7.) In planning, pay attention to magnitudes and the distances, which give an indication of surface brightness.
8.) Knowing something about the object being viewed makes it an interesting object, and not just some faint fuzzy thing.
9.) Negative observations will be accepted, but only if one knows EXACTLY where in the field of view to look.
10.) The only way to know for sure if something is visible, on that night, with that telescope, and with that night's vision, is to LOOK for yourself. Adopt the theory, that within reason anything may be seen - Until you have visually proven otherwise.

This year's advanced program highlights 39 interesting objects, and most are viewable in small to medium sized amateur optics.

To receive a TSP Advanced Observing Pin - From the One and Only - TEXAS STAR PARTY:

1.) An Advanced Observing Pin will be awarded for observing any 20 of the listed objects – Depending on sky conditions.
2.) At least one of the objects with multiple targets must be observed.
3.) All observations must be made at the Texas Star Party.
4.) Any telescope may be used or any combination of telescopes.
5.) Location by Star-Hopping is preferred, but computer "Go-To" systems are accepted.
6.) Observation programs from previous years may be completed for appropriate pins.
7.) T-Shirts are available for those completing ALL the Advanced Programs, including the TSP2024 Latham Springs event.
8.) Observations may be turned in to Larry Mitchell anytime during the Star Party.

To those of you who only complete part of the list, but who have worked hard at it, you have successfully completed the spirit of the program. You have improved your observing skills, learned something about the night sky and hopefully enjoyed yourself…. And you can always get that observing pin next year – I still have plenty. Many people have enthusiastically stated how amazed they were - at themselves - For observing these objects and with their own equipment.

◄ EXPAND YOUR PERCEIVED OBSERVING LIMITS - THIS IS WHAT THE ADVANCED PROGRAM IS ALL ABOUT ►

I hope you enjoy this challenge as much as I have in presenting it and that it gives you a new sense of Enjoyment and Confidence in your Abilities to Successfully View – With Your Own Eyes - Natures Grandest Arena - Our Wonderful - Magnificent Universe.

Larry Mitchell
TSP Advanced Observing Program – 2025
(larry.mitchell12@comcast.net)

The Texas Star Party – Advanced Observing 2025

"A Little Bit of Everything"

Observe Any 20 Objects (At Least 1 of Multiples) – Receive a 2025 TSP Advance Observing Pin

Name	Alt. Name	Coord. J2000	Const.	Mag.	Size	Dist.	Class
NGC2419	GCl 12	07 38 08.5 +38 52 55	Lyn	10.05 (V)	4.3′ x 4.6′	310,000 Lyrs	G.C.
NGC2420	Cr 154	07 38 24.0 +21 34 24	Gem	8.3 (V)	10.0′ x 10.0′	8,435 Lyrs	O.C.
APM 08279+5255 A.B.C.		08 31 41.6 +52 45 18	Lyn	15.2 (V)	Stellar	23.527 GLYrs	QSO
Messier 67	Blue Stragglers	08 51 24.0 +11 49 00	Cnc	6.9 (V)	29′	2,775 Lyrs	*
B0957+561 A-B	Double QSO	10 01 20.9 +55 53 50	Uma	16.95 (V)	Stellar	13.820 GLyrs	QSO
Leo Minor Chain	NGC3159	10 13 59.2 +38 39 25	LMi	13.6 (V)	4.4′ x 2.0′	322.0 MLyrs	Gal
	NGC3161	10 13 59.2 +38 39 25		14.5 (P)	1.5′ X 0.8′	287.0 MLyrs	Gal
	NGC3163	10 14 07.1 +38 39 08		13.3 (V)	1.8′ x 1.8	289 MLyrs	Gal
Lalande 21185	Gliese 2147	11 03 20.3 +35 58 53	Uma	7.52 (V)	Stellar	8.3 Lyrs	*
NGC3718	Arp 214	11 32 35.0 +53 04 05	UMa	10.61(V)	9.2′ x 4.4′	55.0 MLYrs	Gal
Hickson 56	PGC35609	11 32 32.4 +52 56 22	UMa	16.4(B)	0.5′ x 0.3′	367.2 MLyrs	Gal
	PGC35615	11 32 35.1 +52 56 52		16.8(B)	0.4′ x 0.3′	388.7 MLyrs	Gal
	PGC35618	11 32 36.8 +52 56 52		15.8 (B)	0.7′ x 0.4′	377.7 MLyrs	Gal
	PGC35620	11 32 40.0 +52 57 00		16.2(B)	0.7′ x 0.3′	709.1 MLyrs	Gal
	PGC35631	11 32 46.5 +52 56 29		16.2(B)	1.3′ x 0.2′	384.0 MLyrs	Gal
UGC6541	Papillon	11 33 29.2 +49 33 29	Uma	14.2 (V)	1.5′ X 0.8′	14.4 MLyrs	Gal
Laevens 1	Crater Cluster	11 36 16.2 -10 52 39	Cra	--	0.46′	472,700 Lyrs	G.C.
Leo Chain	NGC3837	11 43 56.4 +19 53 40	Leo	14.7 (B)	1.0′ x 1.0′	292.5 MLyrs	Gal
	NGC3841	11 44 02.1 +19 58 18		15.8 (B)	0.6′ x 0.6′	289.5 MLyrs	Gal
	NGC3842	11 44 02.1 +19 56 59		11.8 (V)	1.4′ x 1.2′	330.0 MLyrs	Gal
	NGC3844	11 44 00.8 +20 01 46		13.8 (V)	1.5′ x 0.4′	318.0 MLyrs	Gal
	NGC3845	11 44 05.5 +19 59 45		15.5 (B)	0.8′ x 0.5′	262.8 MLyrs	Gal
Polarissima	NGC3172	11 47 14.4 +89 05 34	Umi	14.8 (V)	1.2′ x 1.1′	281.0 MLYrs	Gal
UGC7321	MCG+4-29-60	12 17 34.1 +22 32 27	Com	14.2 (B)	5.5′ x 0.3′	55.0 MLyrs	Gal
NGC4449	UGC7592	12 28 11.4 +44 05 40	Cvn	9.64 (V)	6.1′ x 4.3′	12.5 MLYrs	Gal
Star Cluster		12 28 11.0 +44 05 33		--	12″ x 12″	--	O.C.
HII-2		12 28 08.7 +44 05 15		--	16″ x 13″	--	ENeb
HII-5		12 28 14.3 +44 07 11		--	Stellar	--	ENeb
HII-3		12 28 18.1 +44 06 31		--	Stellar	--	ENeb
GC-52		12 28 06.6 +44 06 08		--	Stellar	--	G..C
GC-58		12 28 06.4 +44 05 55		--	Stellar	--	G.C.
Centaurus Chain	NGC4622A	12 43 49.3 -40 42 55	Cen	14.5 (B)	0.6′ x 0.5′	220.4 MLyrs	Gal
	NGC4622B	12 43 51.4 -40 43 04		4.96 (B)	1.4′ x 0.5′	215.7 MLyrs	Gal
	NGC4650	12 44 19.5 -40 43 54		11.91(V)	2.0′ x 1.8′	131.9 MLyrs	Gal
	PGC42911	12 44 29.1 -40 43 39		15.3 (V(	0.8′ x 0.3′	207.4 MLyrs	Gal
	NGC4650A	12 44 49.2 -40 42 52		13.58 (V)	1.8′ x 0.2′	135.4 MLyrs	Gal
Boomerang Neb.	ESO 172-7	12 44 46.3 -54 31 10	Cen	9.76 (V)	1.4′ x 0.6′	5,000 Lyrs	PPN
NGC5694	Caldwell 66	14 39 36.5 -26 32 18	Hya	10.2 (V)	4.3′ x 1.3′	114,100 Lyrs	C.G.
Virgo Chain	NGC5839	15 05 27.1 +01 38 04	Vir	12.2 (V)	1.3; x 1.1′	57.3 MLyrs	Gal
	NGC5845	15 06 00.5 +01 37 59		11.2 (V)	0.8′ x 0.5′	67.5 MLyrs	Gal
	NGC5846	15 06 29.2 +01 36 23		11.9 (B)	3.5′ x 3.5′	78.5 MLyrs	Gal
	NGC5850	15 07 07.3 +01 32 39		11.5 (B)	4.6′ x 4.1′	115.6 MLyrs	Gal
Markarian 845	MCG +9-25-22	15 07 45.0 +51 27 10	Boo	15.4	1.0′ x 0.3′	642.7 MLyrs	Gal
Draco Trio	NGC5981	15 37 53.3 +59 23 29	Dra	14.2 (B)	3.1′ x 0.6′	82.2 MLyrs	Gal
	NGC5982	15 38 39.8 +59 21 21		12.4 (B)	2.5′ x 1.8′	135.2 MLyrs	Gal
	NGC5985	15 39 37.1 +59 19 55		14.22 (V)	5.5′ x 2.9′	114.9 MLyrs	Gal
Menzel 3	Ant Nebula	16 17 13.4 -51 59 15	Nor	14.0 (V)	25.0″	8,000 LYrs	PN
Abell 2199	NGC6166	16 28 38.5 +39 33 05	Her	--	12′ x 11′	423.8 MLyrs	Gal
NGC6164/65	PK 336-00-1	16 33 52.6 -48 06 40	Nor	6.71 (V)	3.0′ x 3.0′	4,000 LYrs	ENeb
Barnard 68	LDN 57	17 22 38.2 -23 49 34	Oph	--	4.0′ x 4.0′	408 LYrs	DNe

Name	Alt. Name	Coord. J2000	Const.	Mag.	Size	Dist.	Class
Barnard 72	Snake Nebula	17 23 50.1 -23 41 51	Oph	--	37′ x 17′	650 LYrs	DNeb
FSR 1767	--	17 35 43.0 -36 21 28	Sco	16.5 (V)	5.0′ x 8.1′	--	G.C.
Webb's Wreath	HD164922	18 02 29.4 +26 19 19	Her	8.5 (V)	4.9′ x 3.4′	--	Ast
PGC1772537	LEDA 1772537	18 02 41.1 +26 20 31	Her		5.0″ x 5.0″	--	Gal
PGC1768412	LEDA 1768412	18 02 45.9 +26 14 08	Her		47.8″ x 7.1″	229.0 MLYrs	Gal
NGC6537	Red Spider Neb.	18 05 13.1 -19 50 35	Sgr	13.58 (V)	10.0″	3,000 LYrs	P.N.
Gomez's Hamburger	IRAS18059-3211	18 09 13.3 -32 10 48	Sgr	14.4 (V)	0.5″ x 0.3″	6,500 LYrs	PPN
NGC6559	ESO 521-40	18 09 53.0 -24 04 30	Sgr	--	8.3′ x 4.2′	--	ENeb
Minkowski 1-59	Sanduleak 2-358	18 43 20.2 -09 04 49	Sct	13.3 (P)	5.0″ x 5.0″	--	P.N.
SS433	SN W50	19 11 49. 6 +04 58 58	Aql	~15.0 (V)	--	18,000 Lyrs	MQSO
Barnard 142, 143	Barnards "E"	19 40 42.0 +10 57 00	Aql	--	52.0′ x 38.0′	2,000 Lyrs	DNeb
NGC6820	Sh 2-86	19 43 23.0 +23 16 00	Vul	--	24.7′ x 12.0′	6,500 LYrs	ENeb
NGC6823	Collinder 405	19 43 12.0 +23 18 00		--	12.0′ x 12.0′	6,500 LYrs	O.C.
B 1946+7658 A-B	B1946+770	19 44 54.6 +77 05 53	Dra	15.9 (V)	Stellar	17.647 GLyrs	QSO
NGC6822	Barnard's Gal.	19 44 56.35 -14 48 11	Sgr	8.1 (V)	15.6′ x 13.5′	1.55 MLyrs	Gal
Hubble V		19 44 42.2 -14 43 08		10.0 (B)	33″ x 32″	--	ENeb
Hubble VI		19 44 42.2 -14 43 09		16.59 (V)	5.0″ x 5.0″		G.C.?
Hubble VII		19 44 55.8 -14 48 57		15.04 (V)	7.0″7.0″	--	G.C.
Hubble X		19 45 05.3 -14 43 17		9.7 (B)	38″ x 24″	--	ENeb
Sc 3		19 45 40.2 -14 49 26		18.44 (V)	Stellar	--	G.C.
Sc 6		19 45 37.0 -14 41 11		15.38 (V)	Stellar	--	G..C
Tabby's Star	KIC 8462852	20 06 15.5 +44 27 25	Cyg	11.7 (V)	Stellar	1,447 Lyrs	*
NGC6974 ,6979	North Veil	20 50 50.0 +31 58 00	Cyg	--	28.0′ x 7.0′	--	SN
NGC6992, 6995	East Veil	20 57 00.0 +31 30 00	Cyg	--	80.0′ x 26.0′	2,400 LYrs	SN

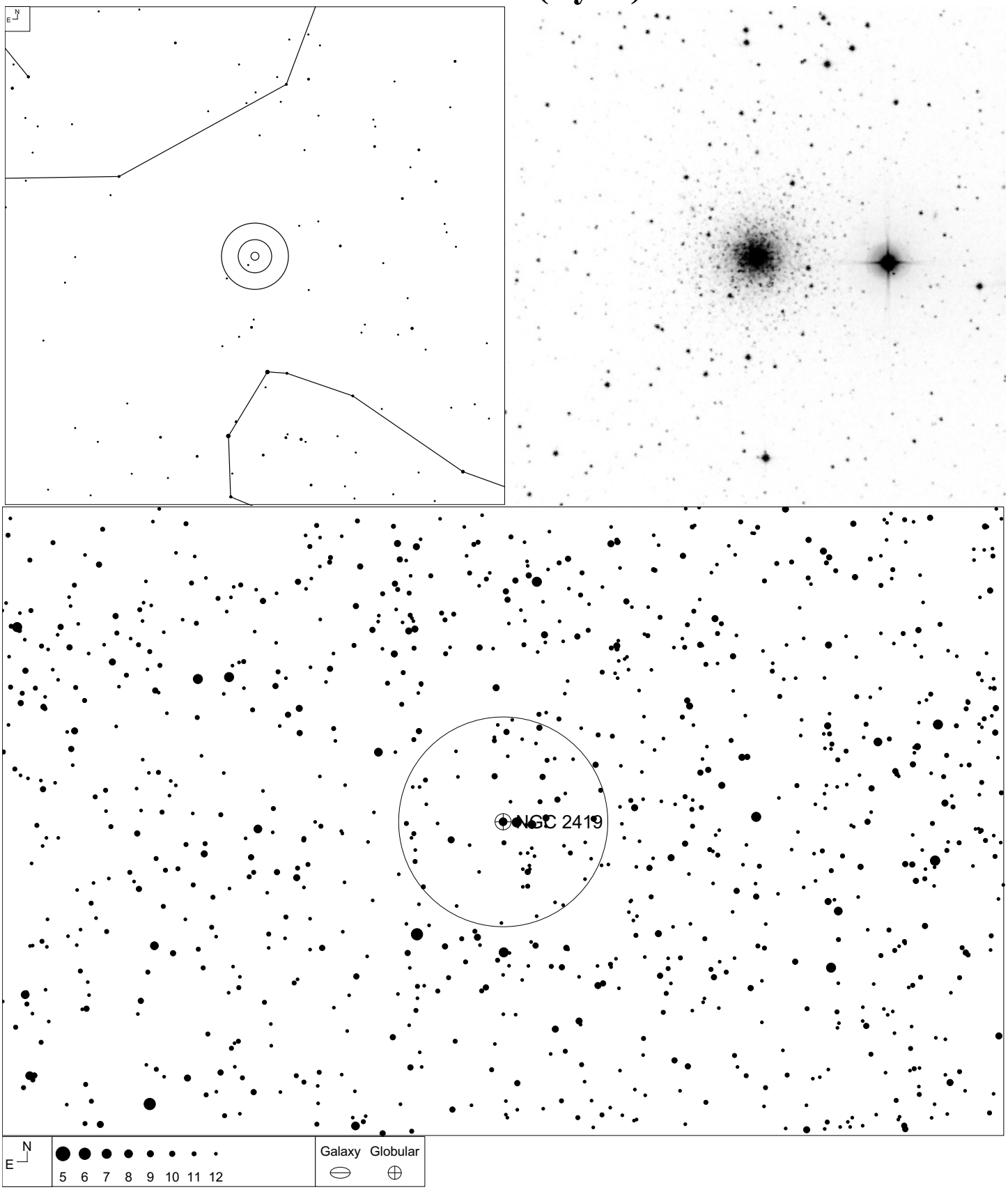
Calculated Distances: ***70 km sec^{-1} Mpc^{-1}, Ω_M=0.286, Ω_{vac}=0.714, Flat Universe***

DNeb – Dark Nebula
ENeb – Emission Nebula
Gal – Galaxy
MQSO – Micro-Quasar
OC – Open Cluster
QSO – Quasar
GC – Globular Cluster
PN – Planetary Nebula
PPN – Proto-Planetary Nebula
*** - Star**
SN – Supernova
Ast - Asterism

QUASARS	SUPERNOVAE	GALAXIES	NEBULAE	STELLAR CLUSTERS	STARS
Single	***Single***	***Single***	***Dark Nebulae***	***Open Clusters***	***Unusual***
APM08279+5255	SS 433	Polarissima	Barnard 68	NGC2419	Tabby's Star
Double Quasar	NGC6992	UGC7321	B72 - The Snake	Messier 67	Lalande 21185
B 1946+7658 A,B	NGC6974	NGC3718	B142 - Barnard's E	NGC4449	***Blue Stragglers***
		NGC4449	***Emission Nebulae***	NGC6823	Messier 67
		NGC6822	NGC4449	***Globular Clusters***	
		UGC6541	NGC6164	Laevens 1	
		Markarian 845	NGC6559	NGC4449	
		Galaxy Chains	NGC6820	NGC5694	
		Leo Minor	NGC6822	FSR 1767	
		Centaurus	Markarian 845	***Asterism***	
		Virgo	NGC6974	Webb's Wreath	
		Draco Trio	NGC6992		
		Galaxy Groups	***Planetary Nebulae***		
		Hickson 56	Menzel 3		
		Abell 2199	NGC6537		

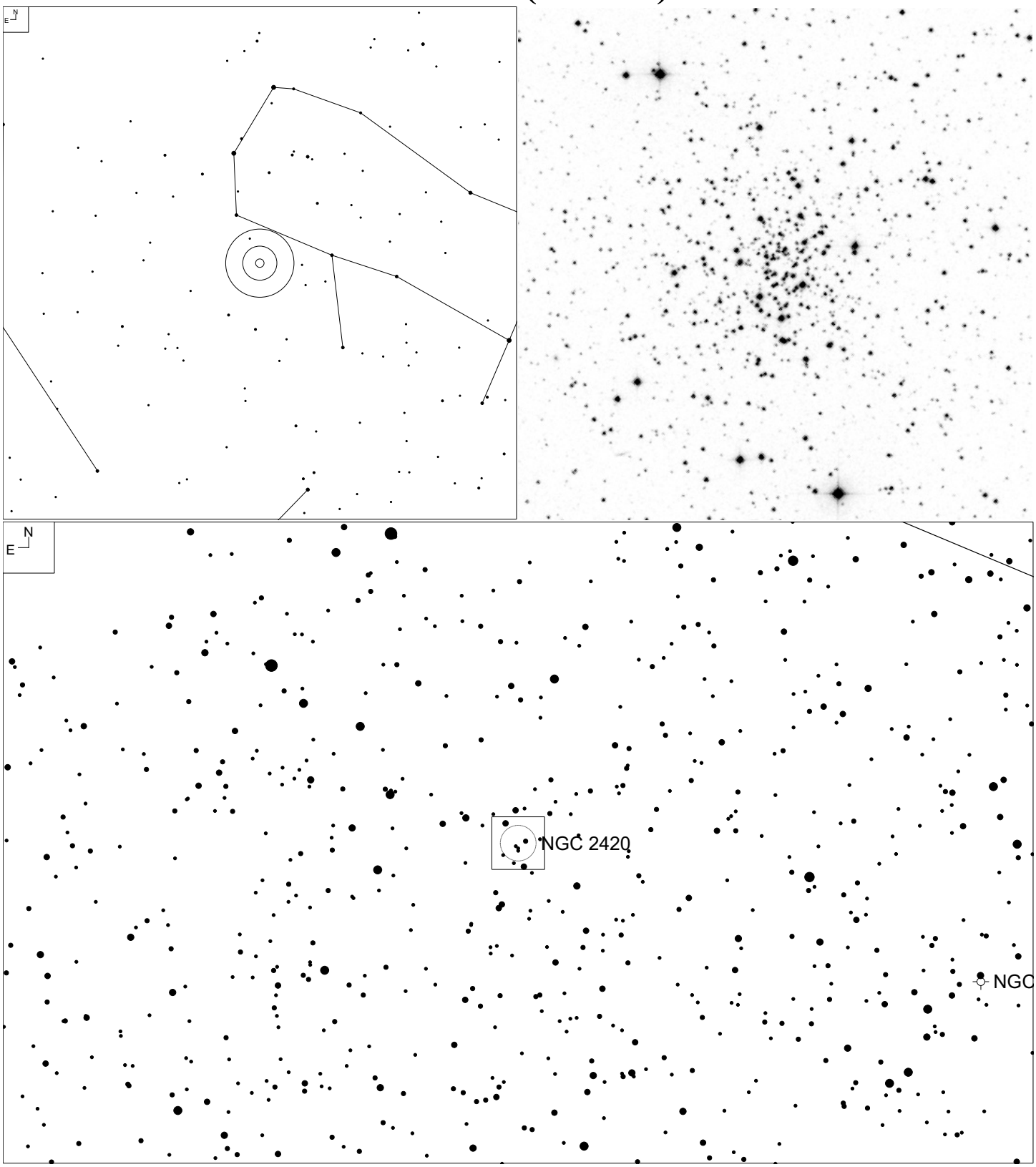
Good Luck
Larry Mitchell

NGC 2419 (Lynx)



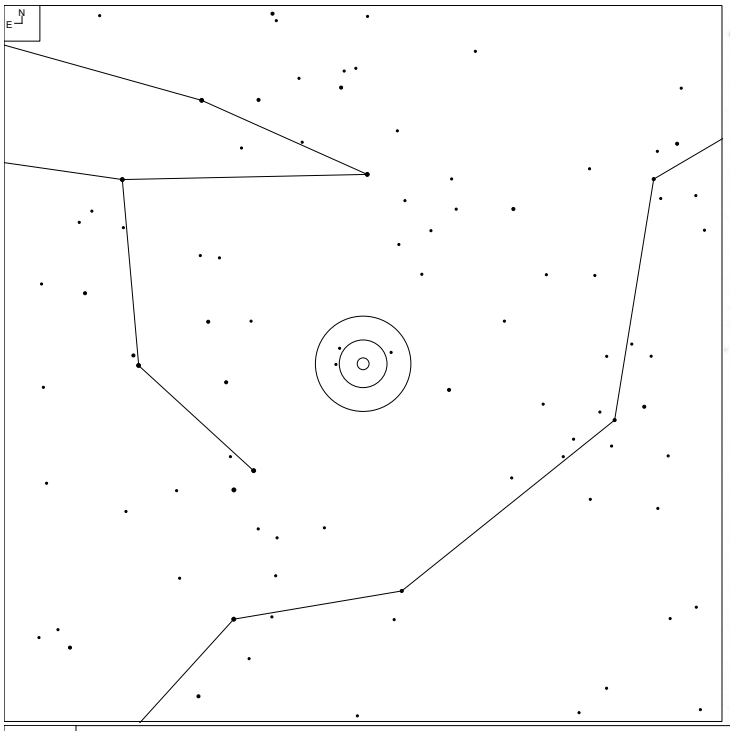
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
GCI 12	07 38 08.5	+38 52 55	10.05v	4.6x4.3’	GC	40	24

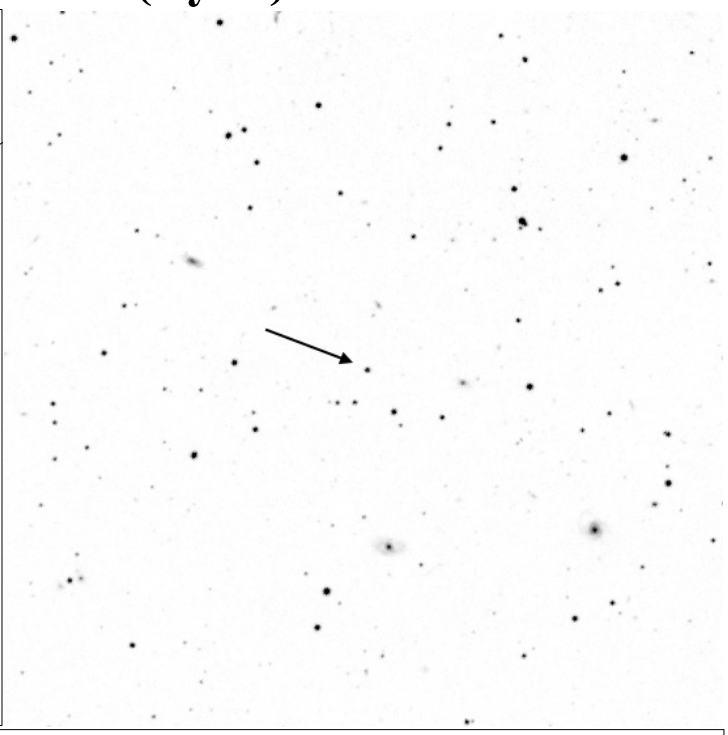
NGC 2420 (Gemini)

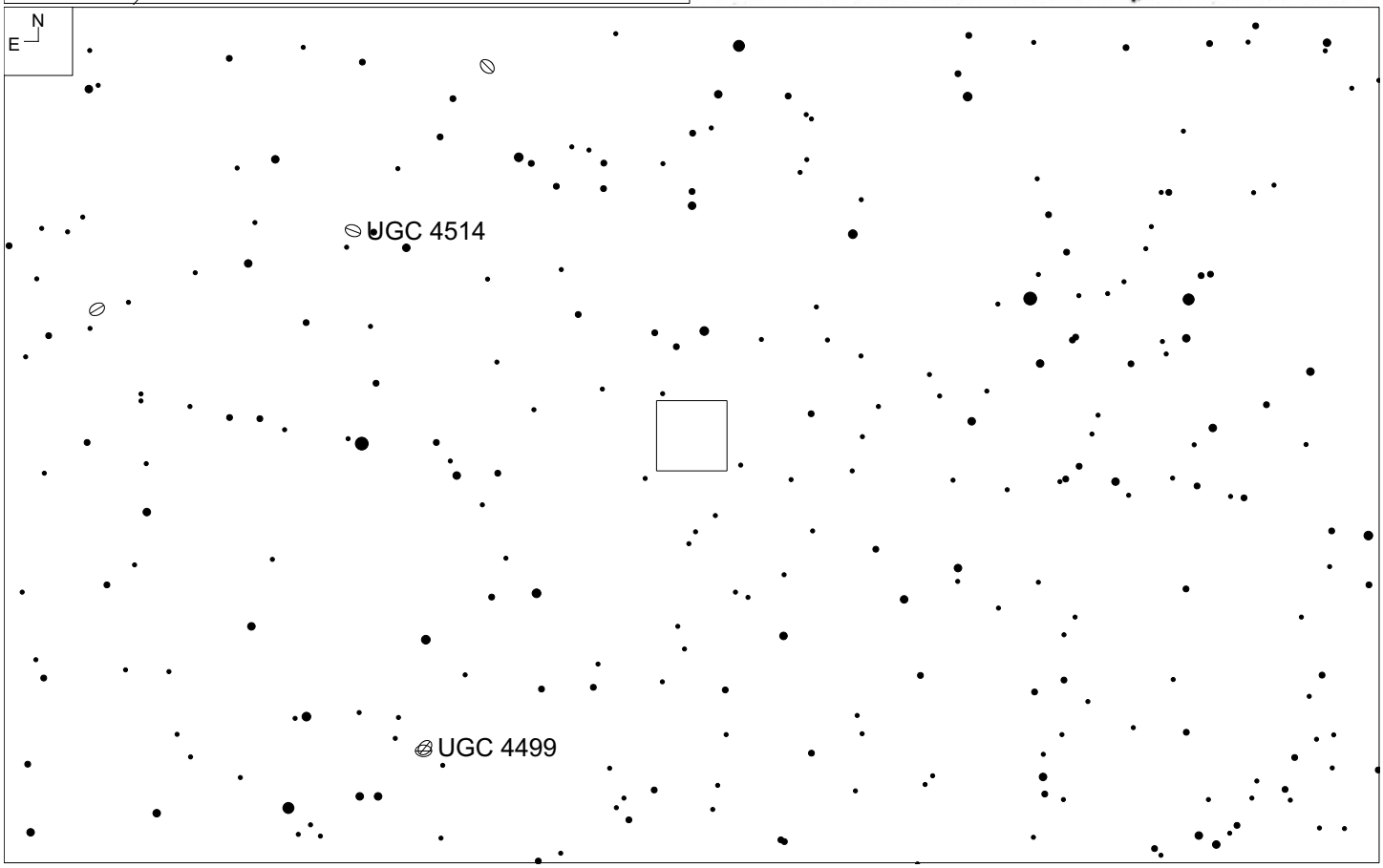


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Cr 154	07 38 24.0	+21 34 24	8.3v	10.0’	OX	75	48

APM 08279+5255 (Lynx)

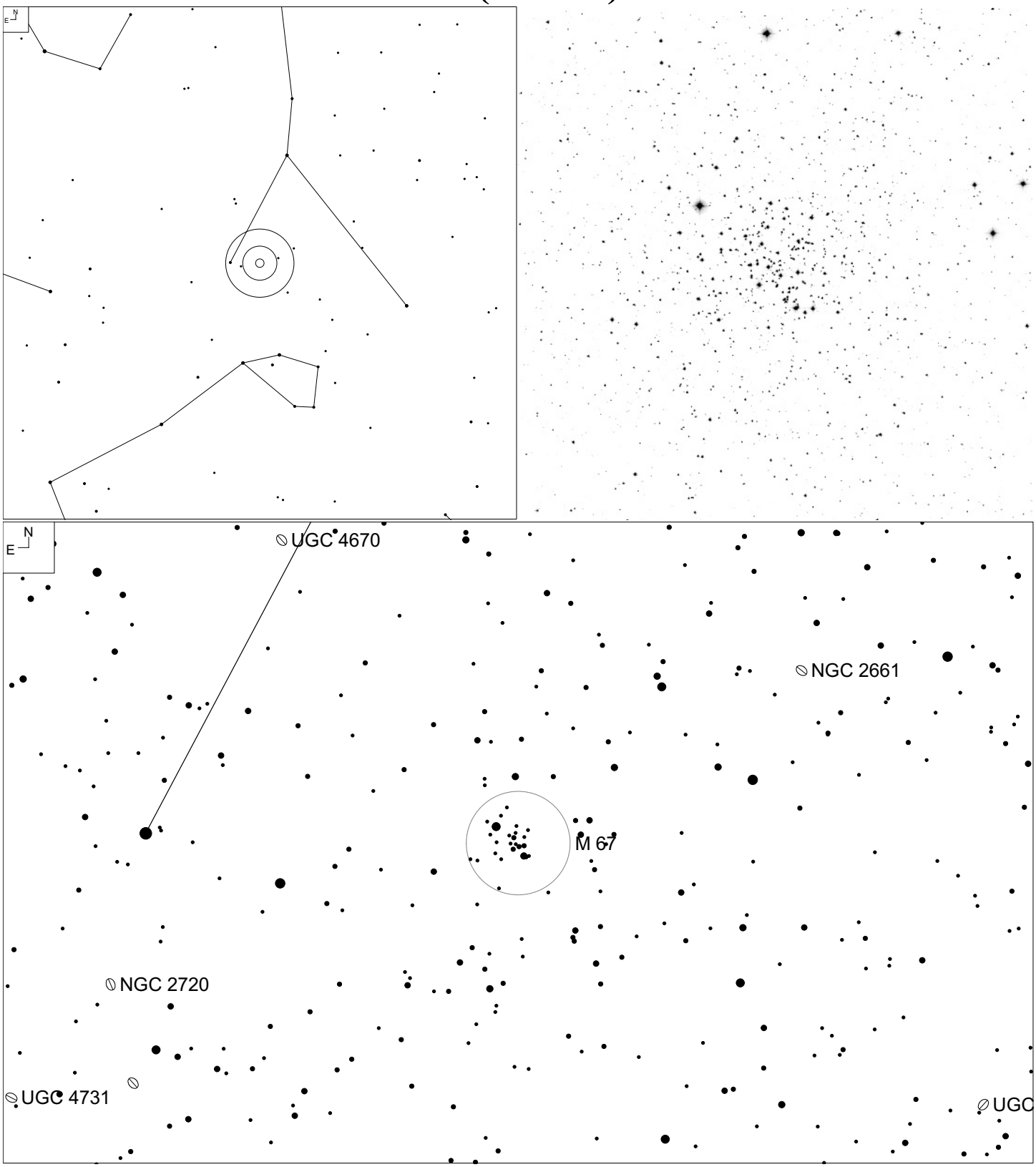






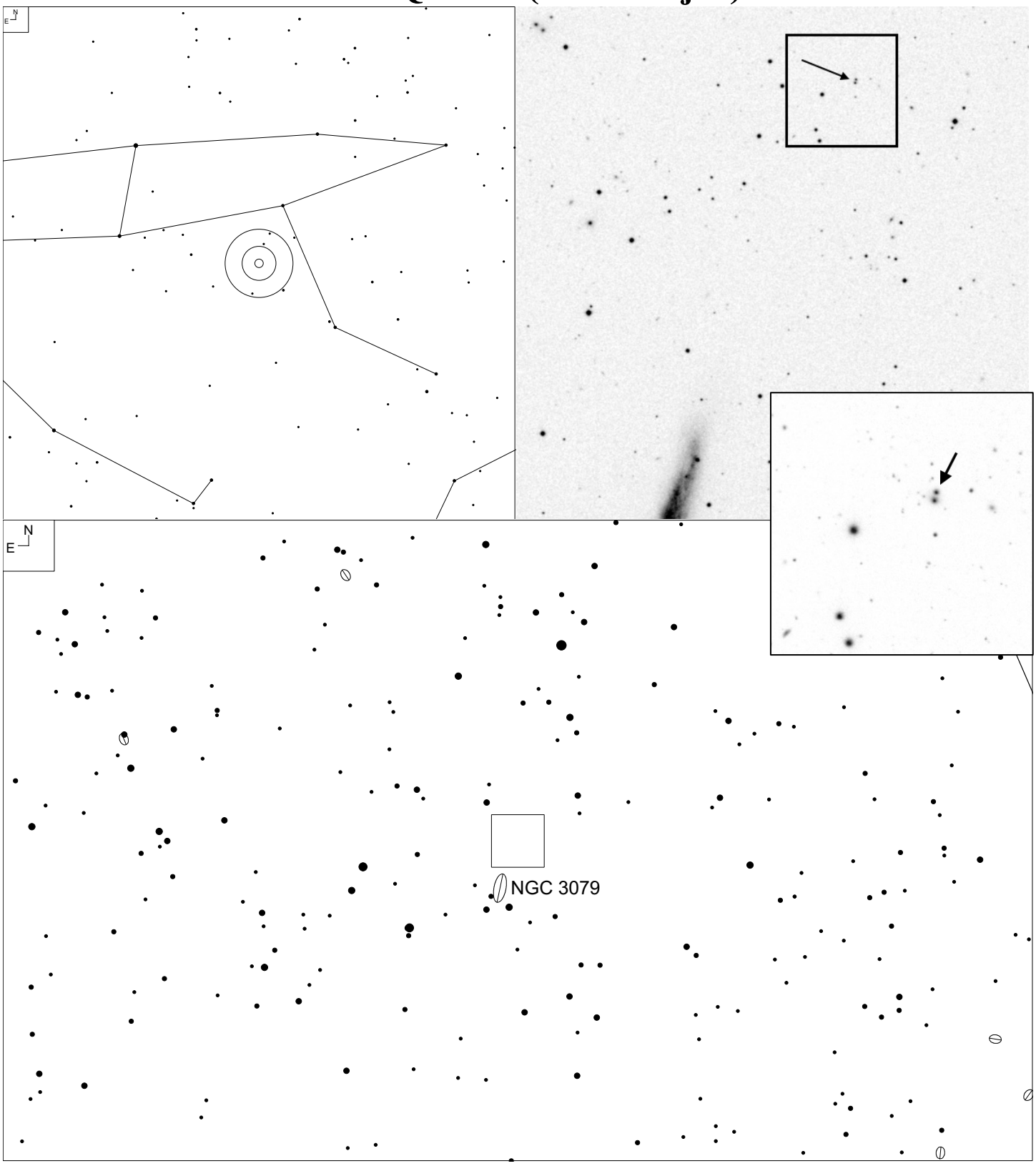
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
QSO J0831+5245	08 31 41.6	+52 45 18	15.2v	stellar	QSO	26	13

M67 (Cancer)



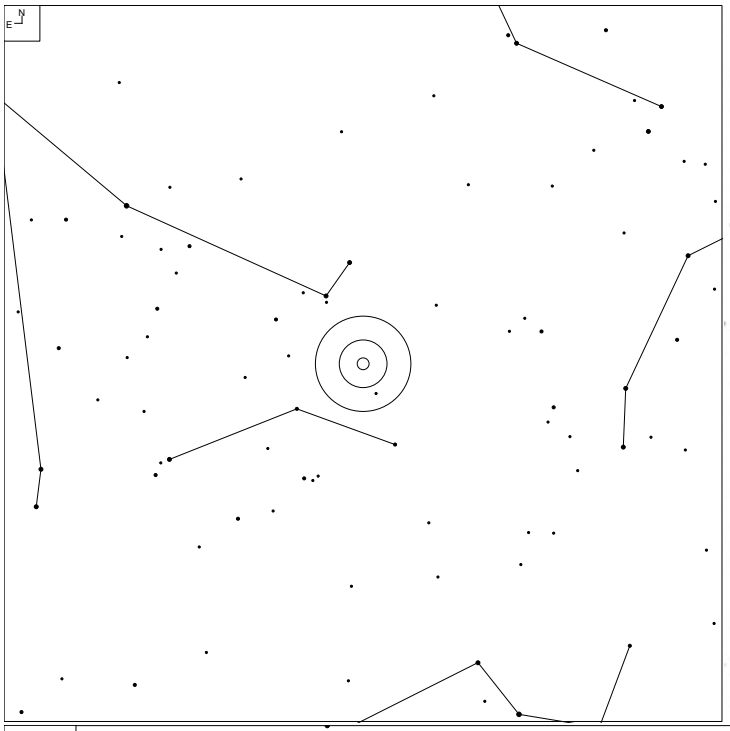
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
	08 51 24.0	+11 49 00	6.9v	29’		94	47

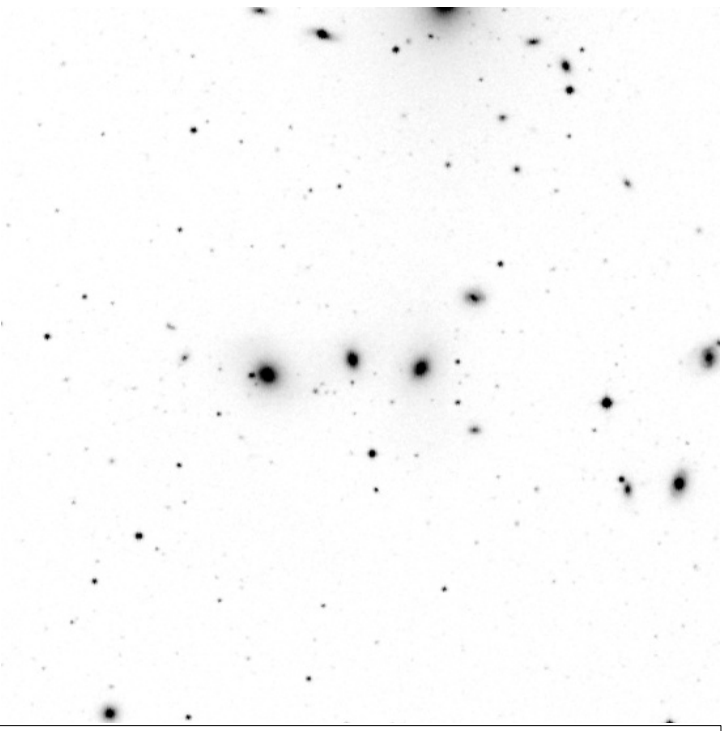
Double Quasar (Ursa Major)

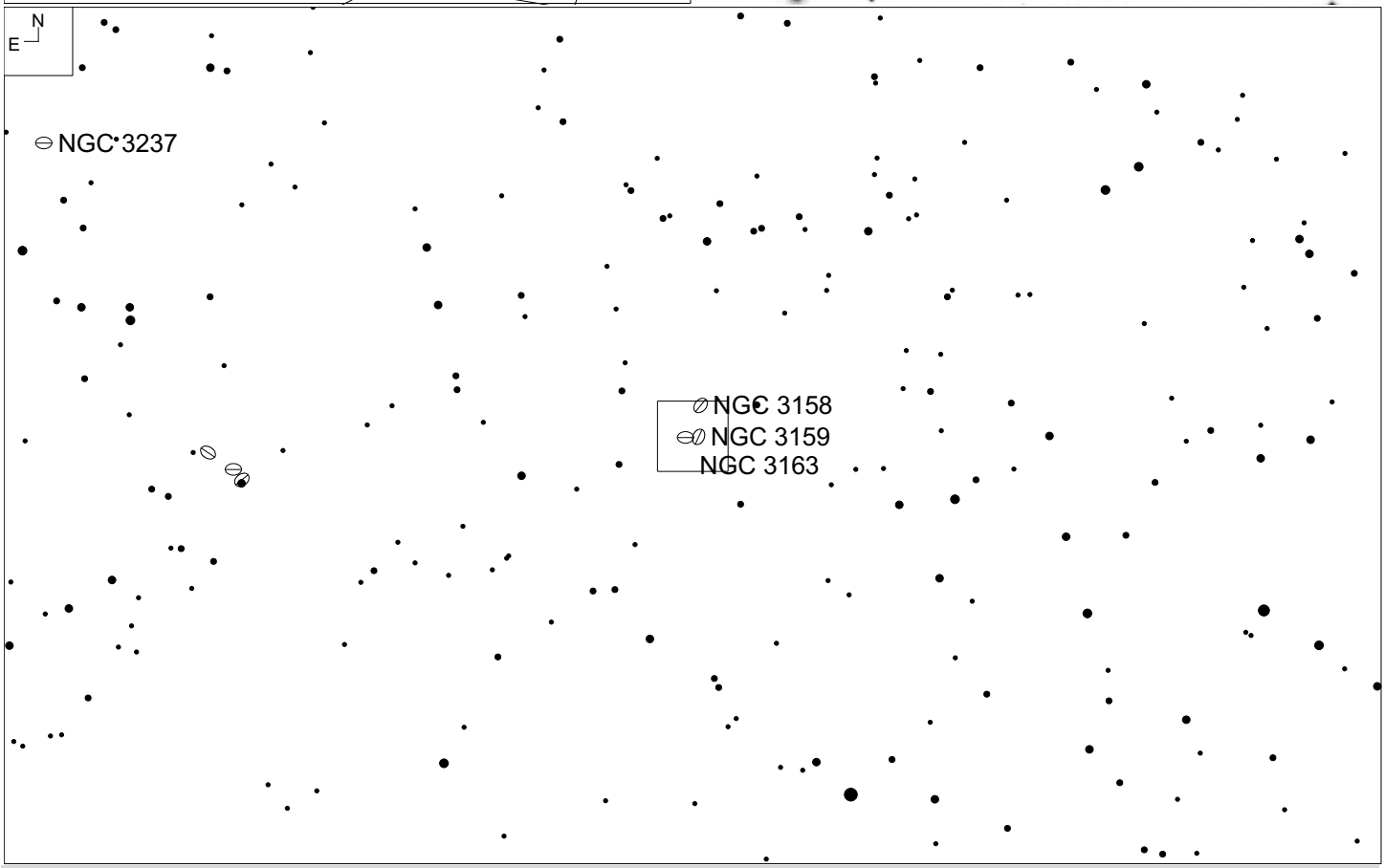


Other ID	RA	Dec	Mag	Separation	Class	Urano 2	iDSA
B0957+561 A-B	10 01 20.9	+55 53 50	16.95v	6.2” apart	QSO	25	12

Leo Minor Chain

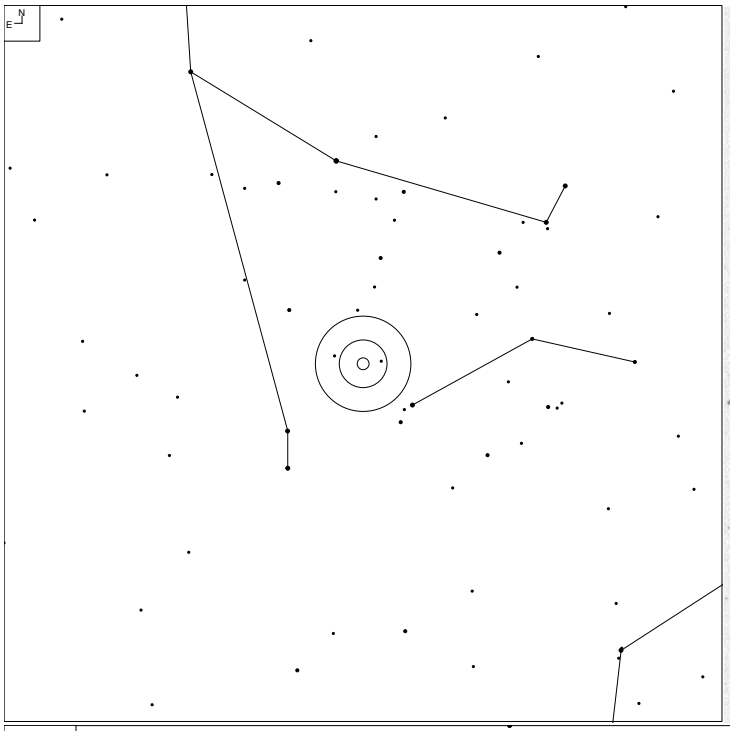


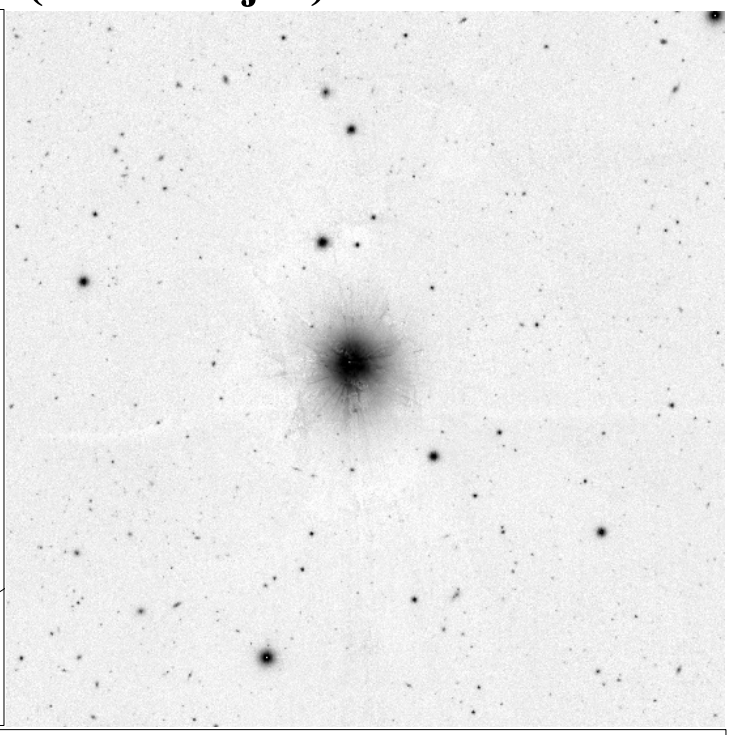


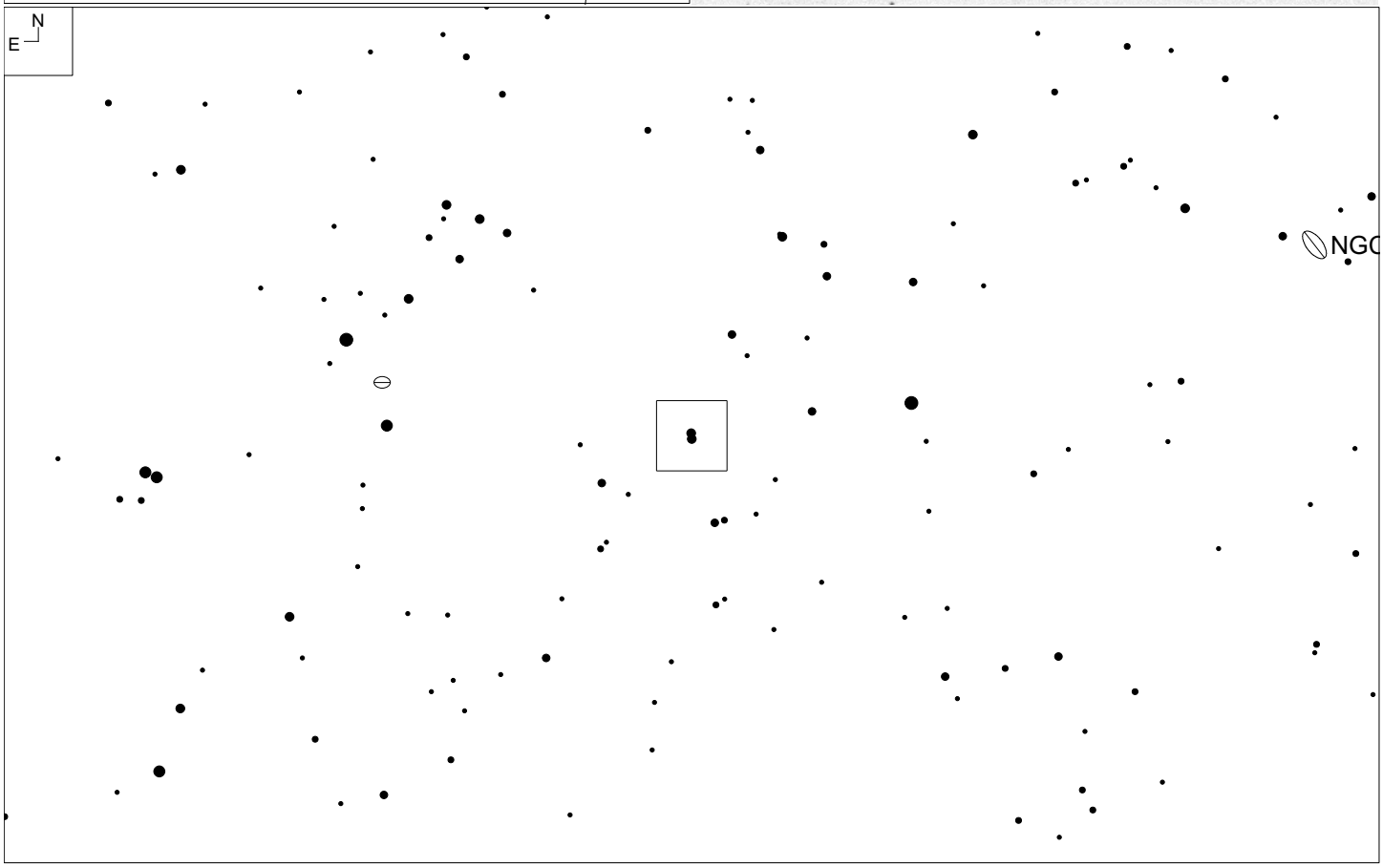


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
NGC3159	10 13 59.2	+38 39 25	13.6v	4.4’ x 2.0’	GX	55	22
NGC3161	10 13 59.2	+38 39 25	14.5p	1.5’ X 0.8’	GX		
NGC3163	10 14 07.1	+38 39 08	13.3v	1.8’ x 1.8	GX		

Lalande 21185 (Ursa Major)

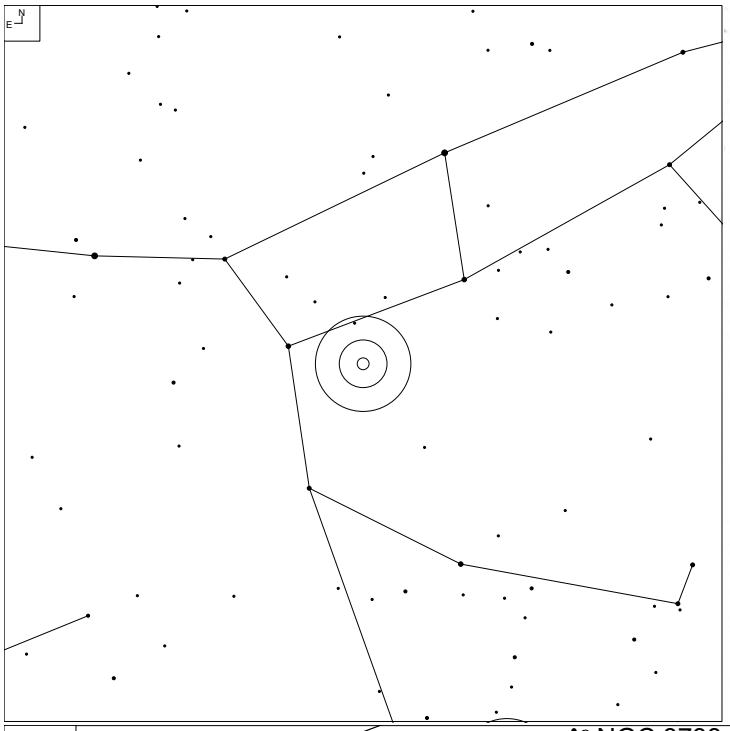


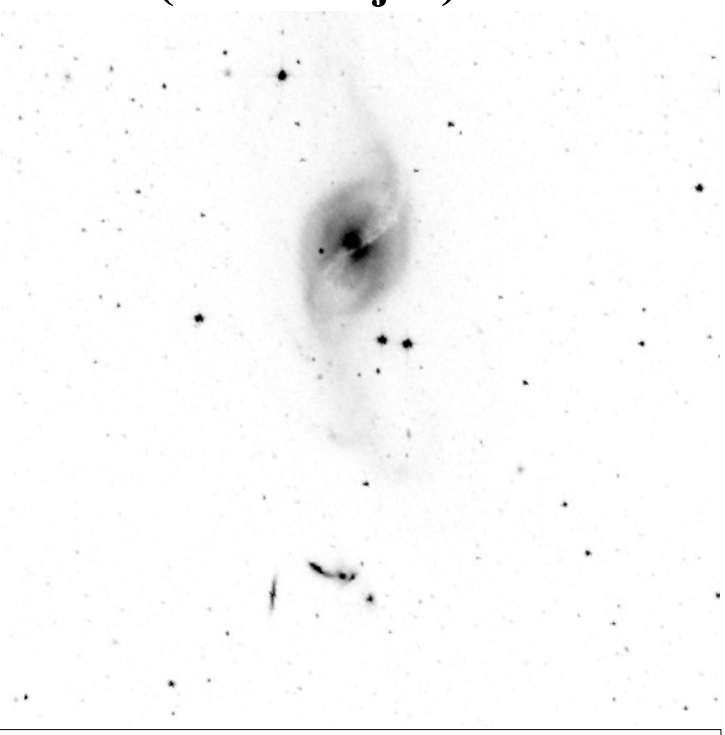


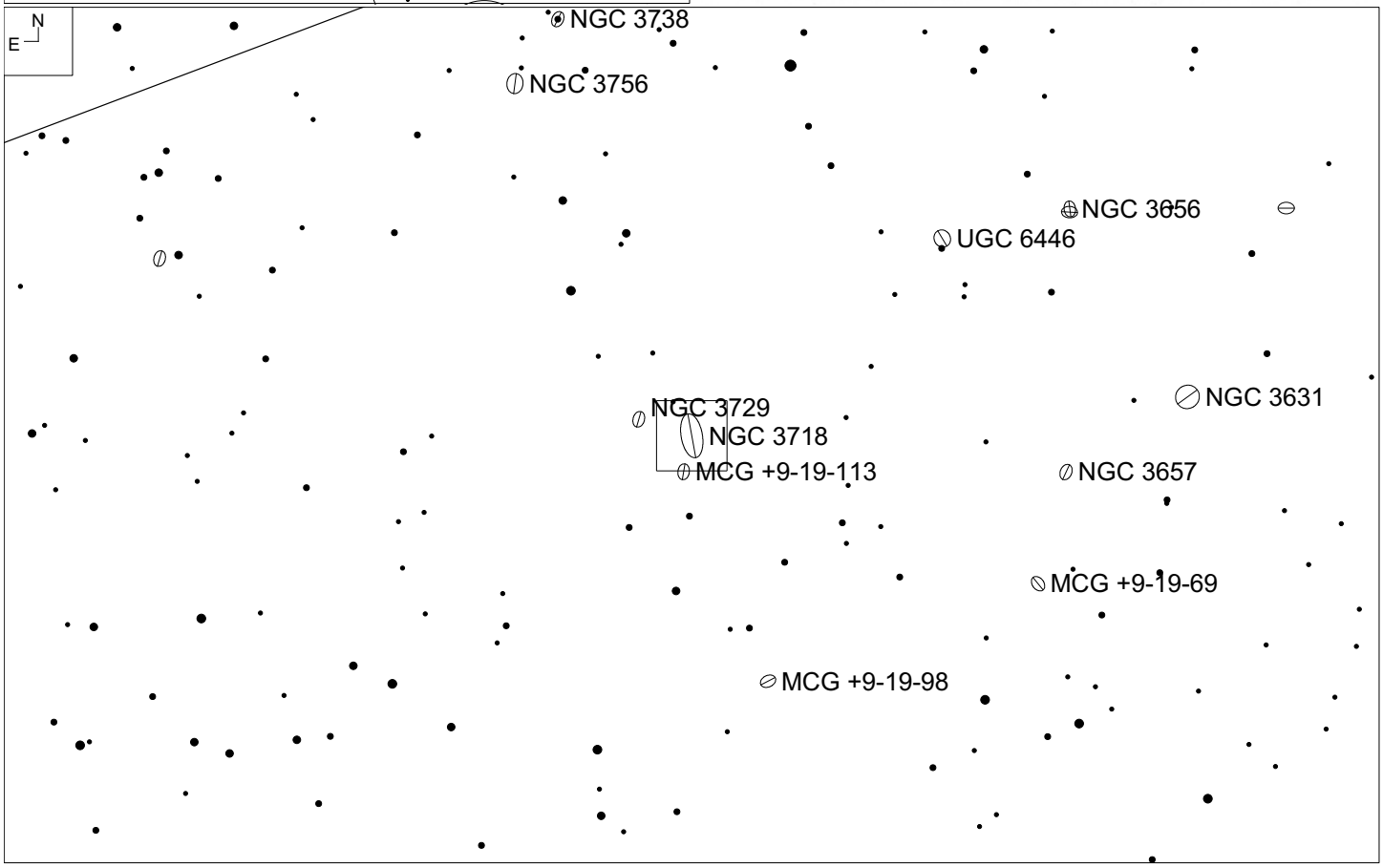


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Gliese 2147	11 03 20.3	+35 58 53	7.52v	stellar	star	55	34

NGC 3718 and Hickson 56 (Ursa Major)

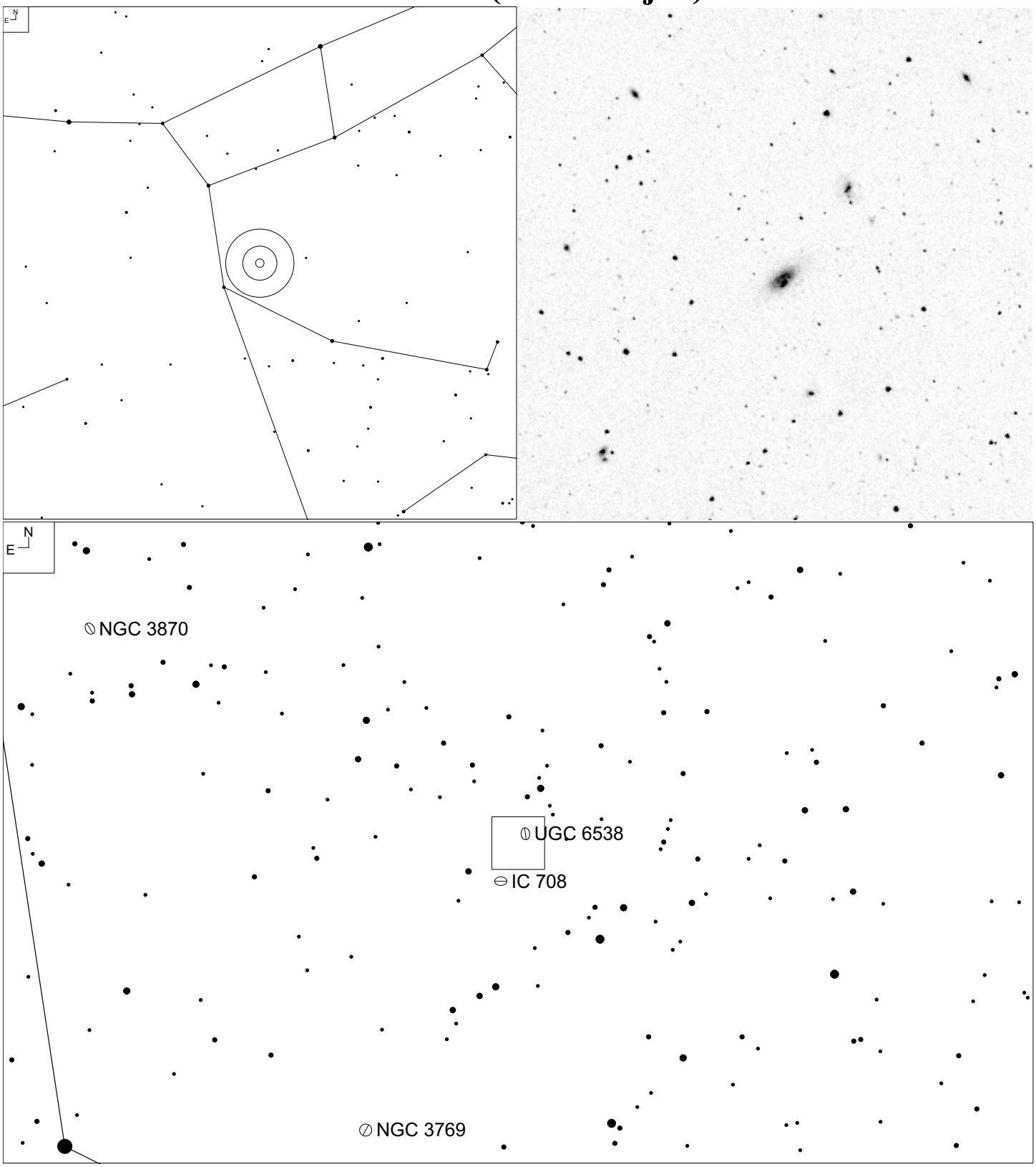






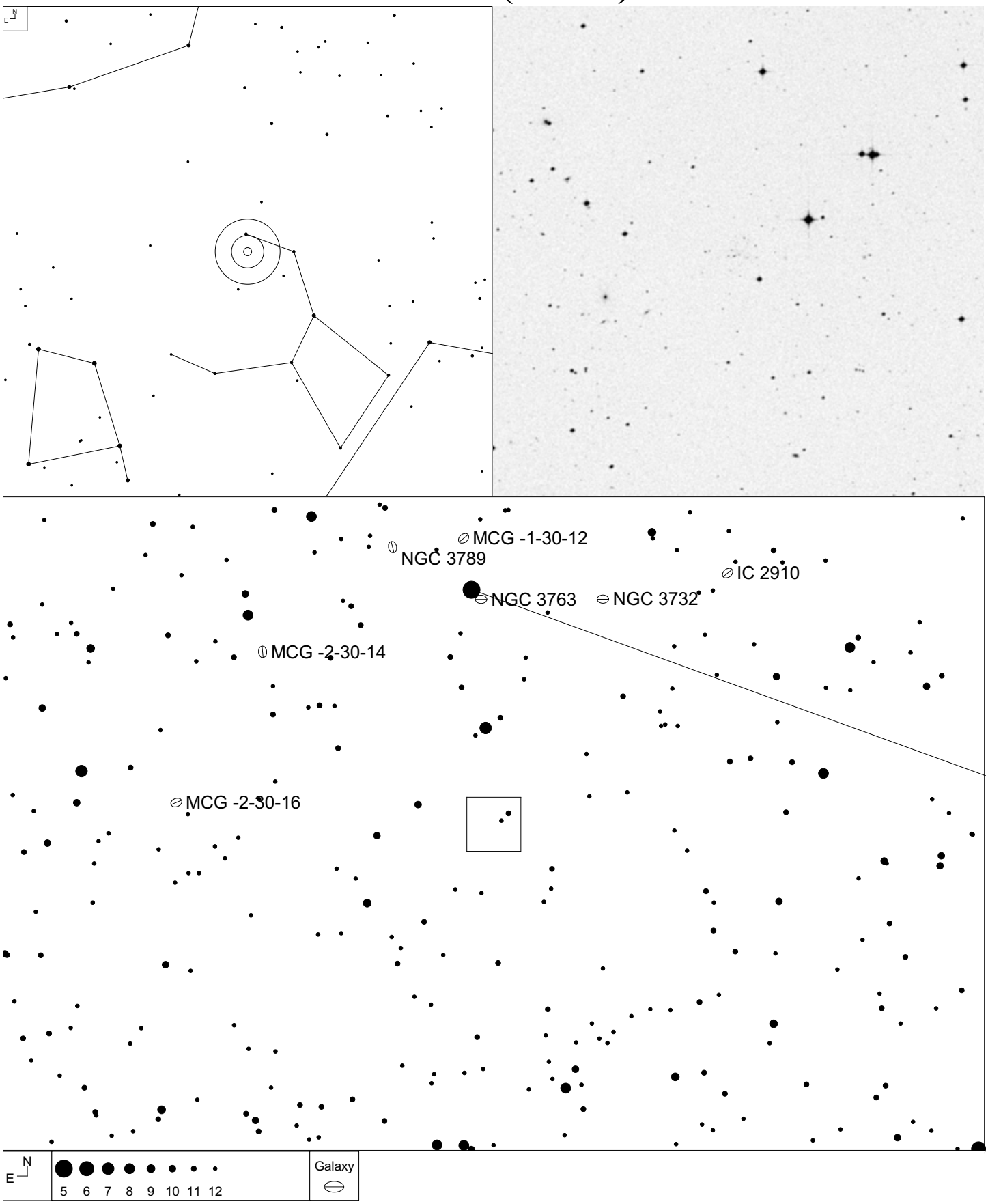
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Arp 214	11 32 35.0	+53 04 05	10.61(V)	9.2’ x 4.4’		24	12
Hickson 56	11 32 32.4	+52 56 22					

UGC 6541 (Ursa Major)



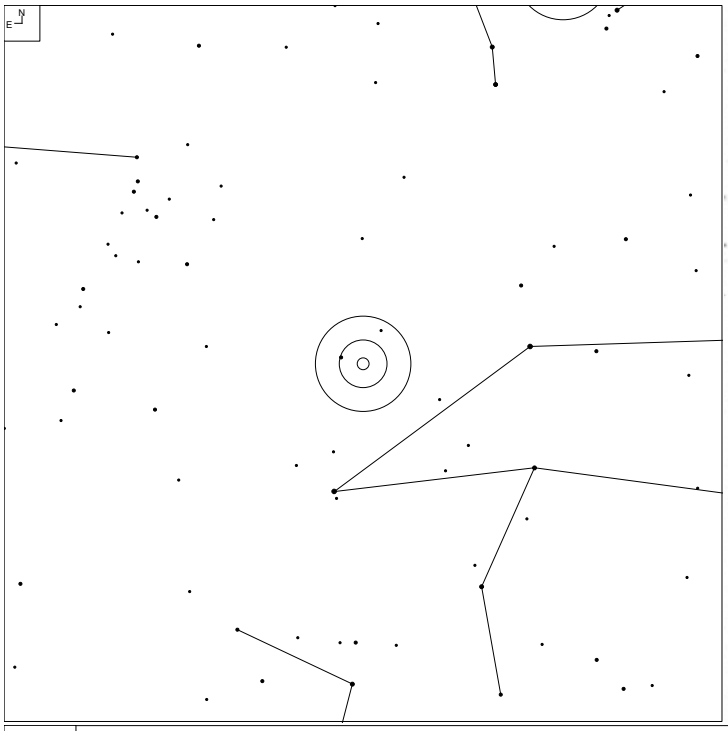
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Papillon	11 33 29.2	+49 14 18	14.2v	1.5’ X 0.8’	Gal	38	22

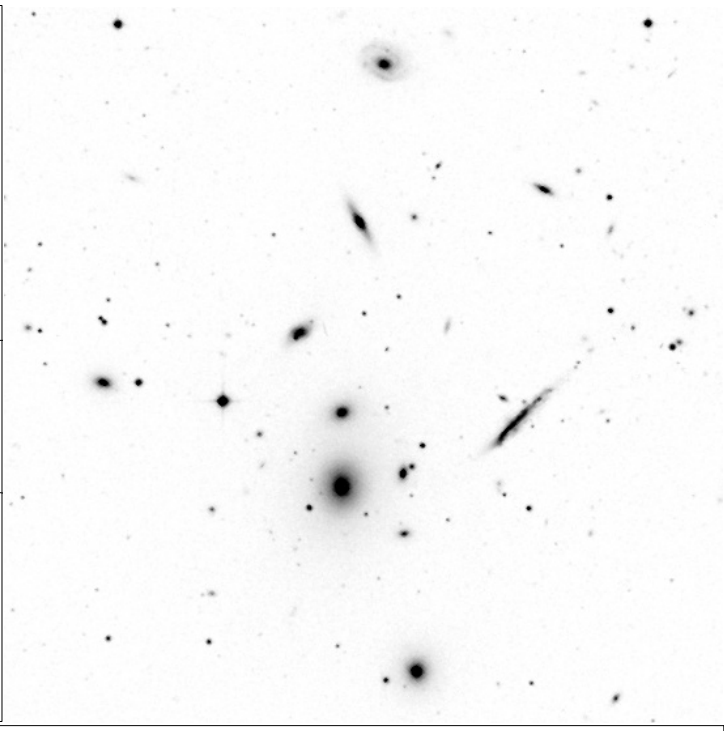
Laevens 1 (Crater)

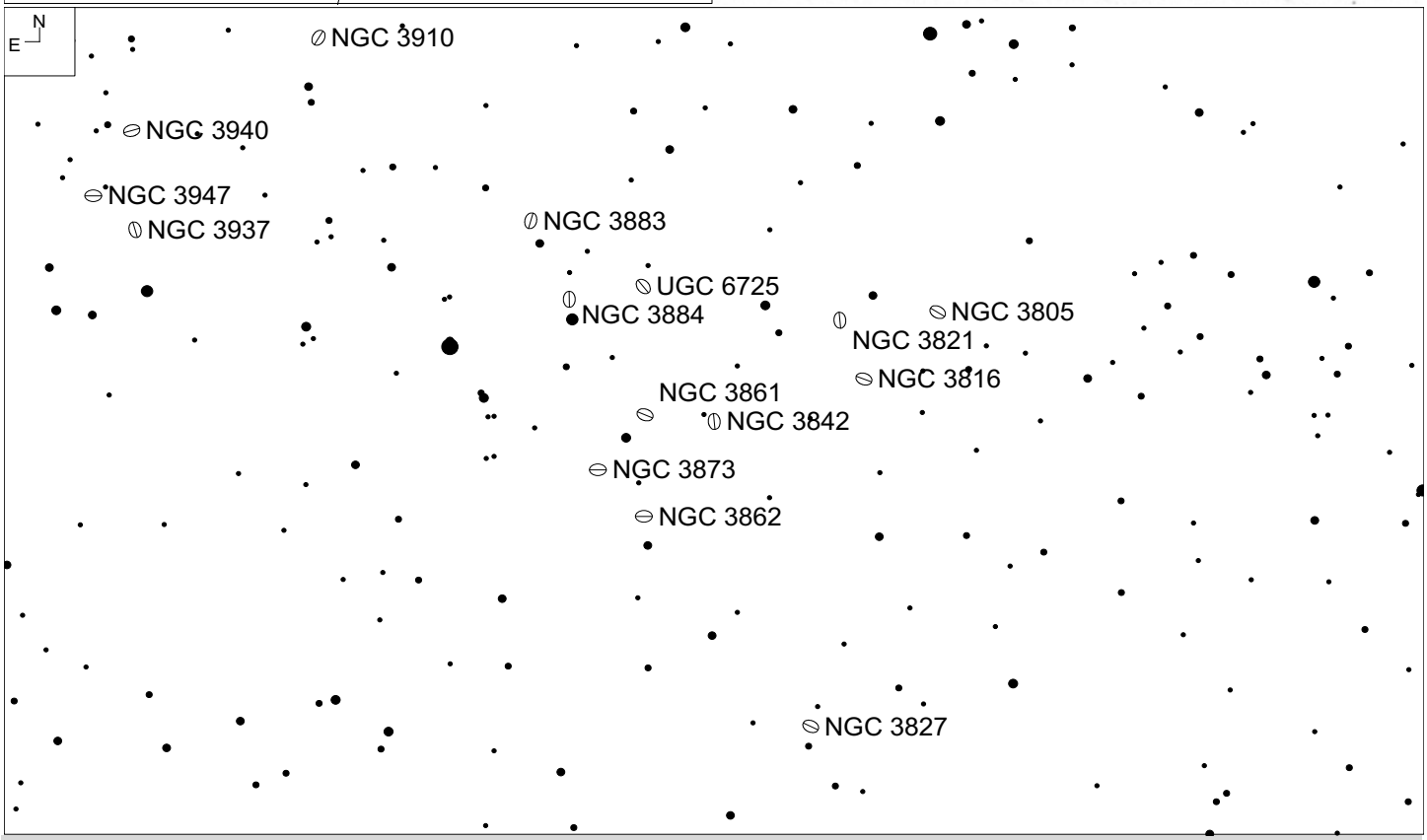


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Crater Cluster			--	0.46’	G.C.	131	70

Leo Chain

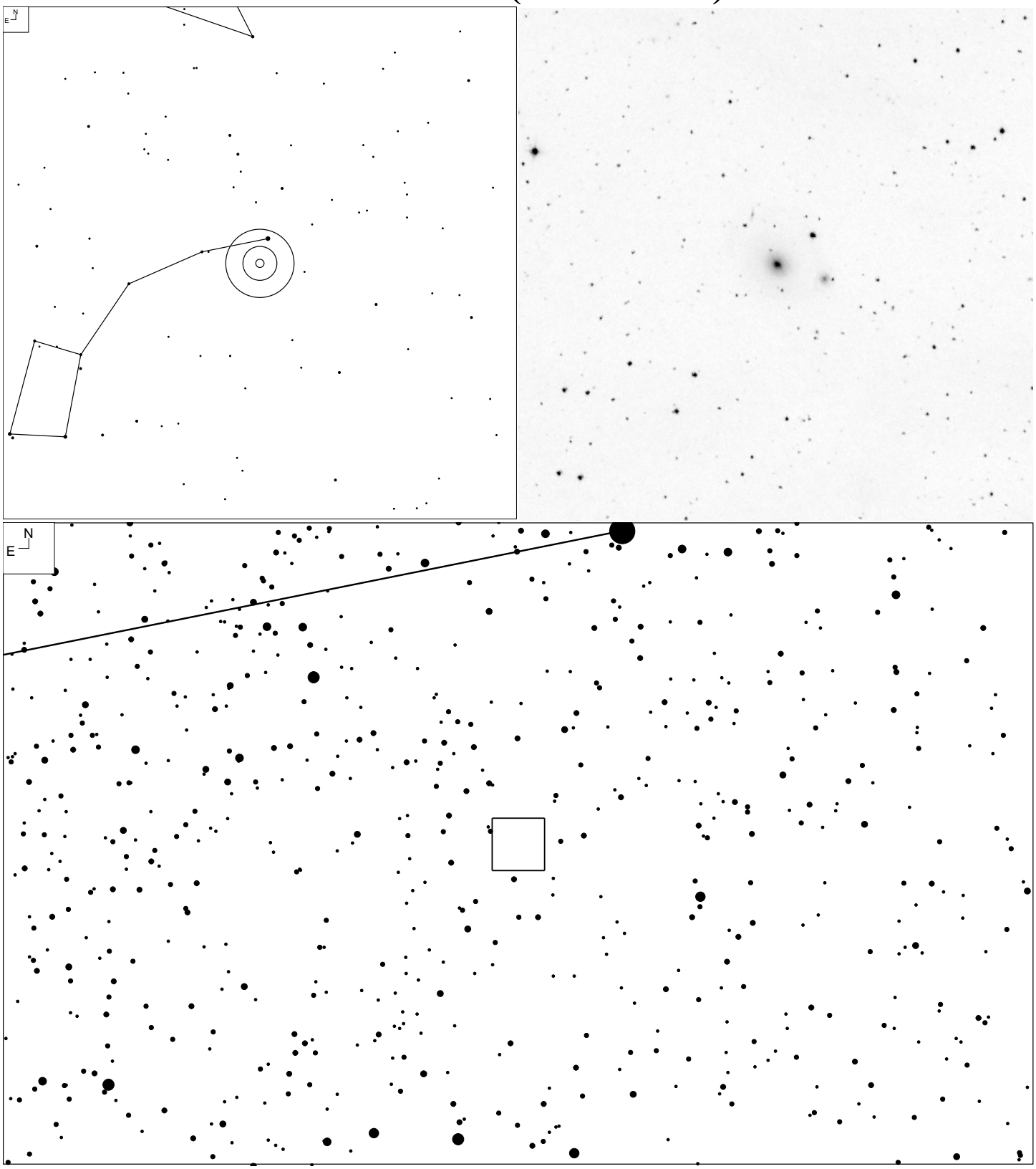






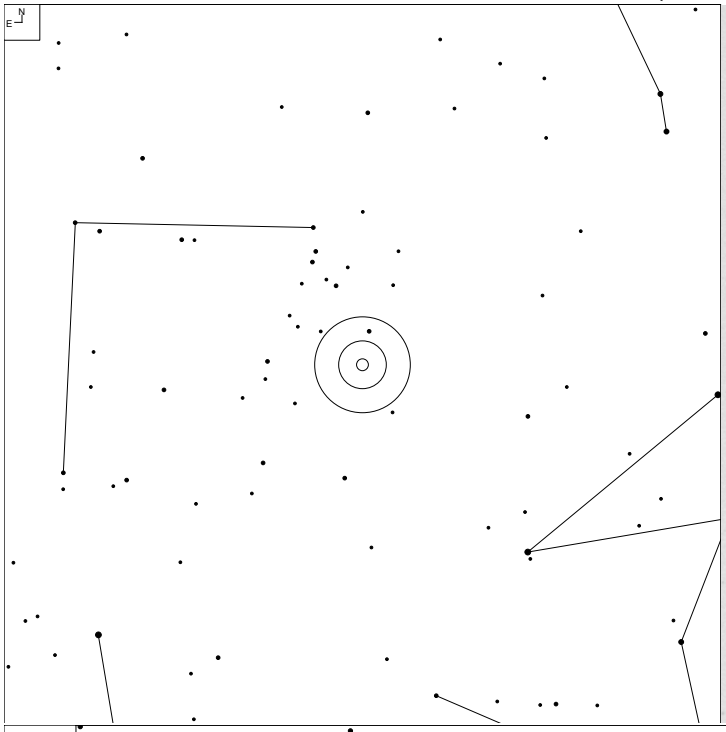
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
NGC3837	11 43 56.4	+19 53 40	14.7b	1.0' x 1.0'	E	72	46
NGC3840	11 43 58.9	+20 04 37	14.5b	1.2 x 0.7'	Sa		
NGC3841	11 44 02.1	+19 58 18	15.8b	0.6' x 0.6'	S0		
NGC3842	11 44 02.1	+19 56 59	11.8v	1.4' x 1.2'	E		
NGC3844	11 44 00.8	+20 01 46	13.8v	1.5' x 0.4'	S0/a		
NGC3845	11 44 05.5	+19 59 45	15.5b	0.8' x 0.5'	S0		

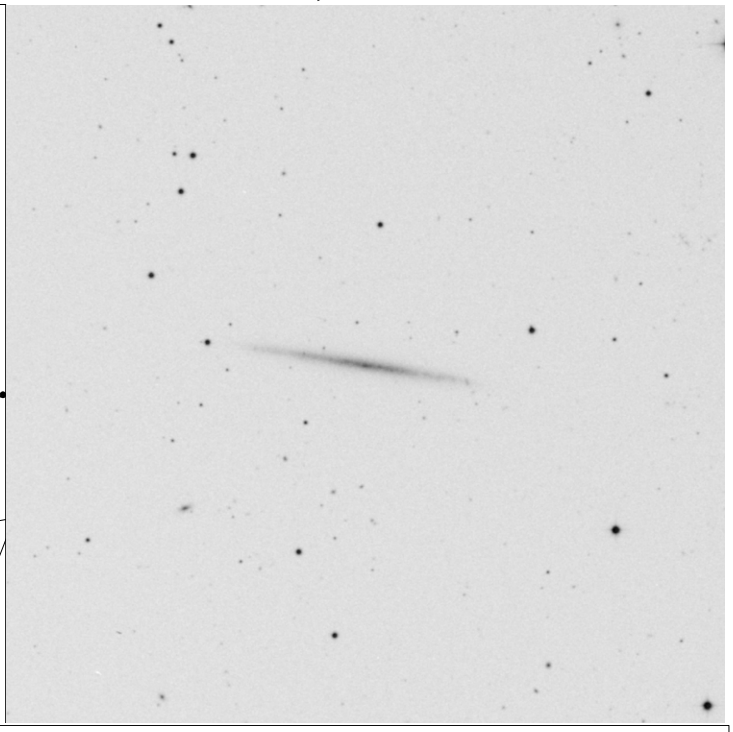
Polarissima (Ursa Minor)

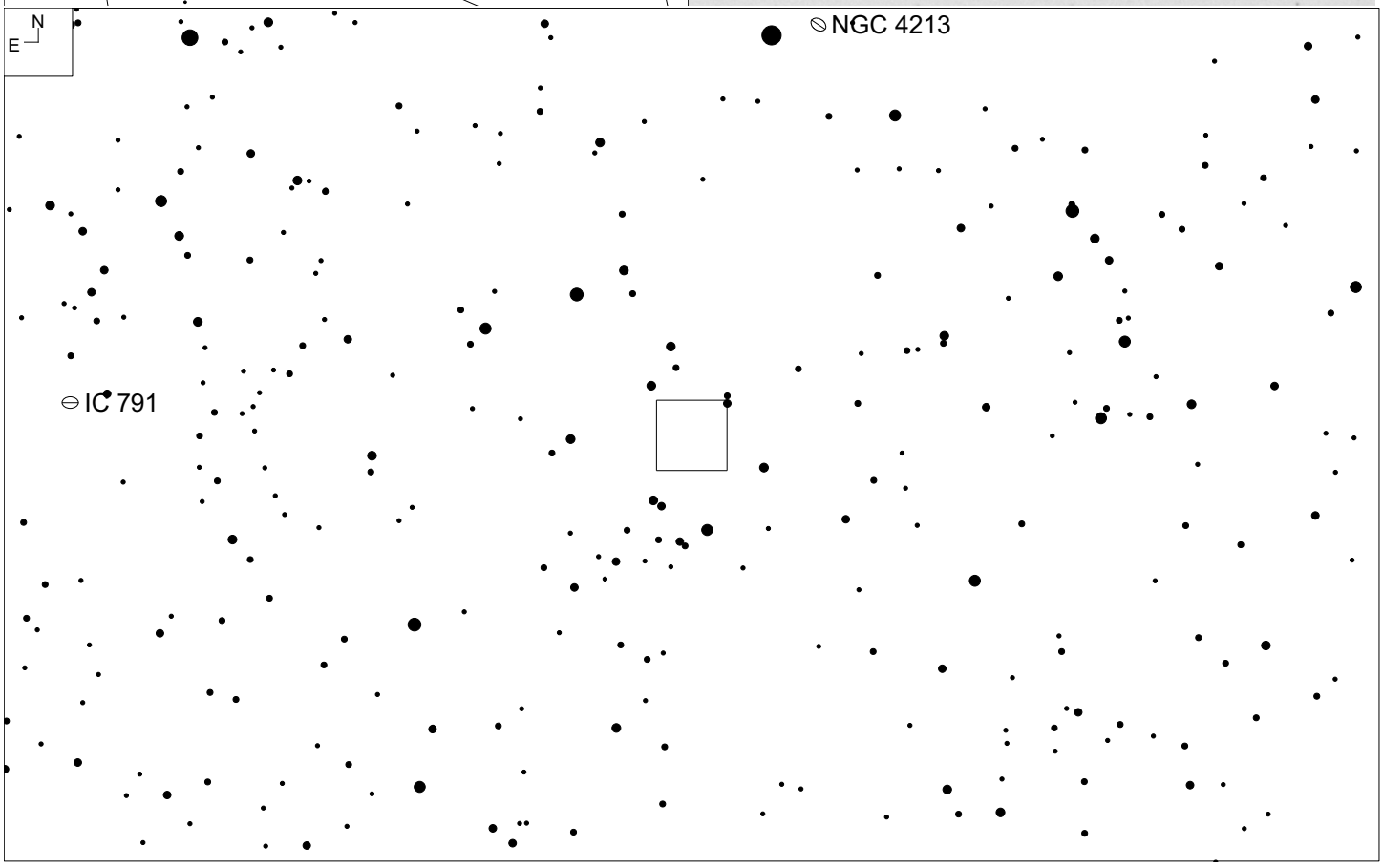


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
NGC3172	11 47 14.4	+89 05 34	14.8v	1.2’ x 1.1’	GX	1	1

UGC 7321 (Coma Berenices)

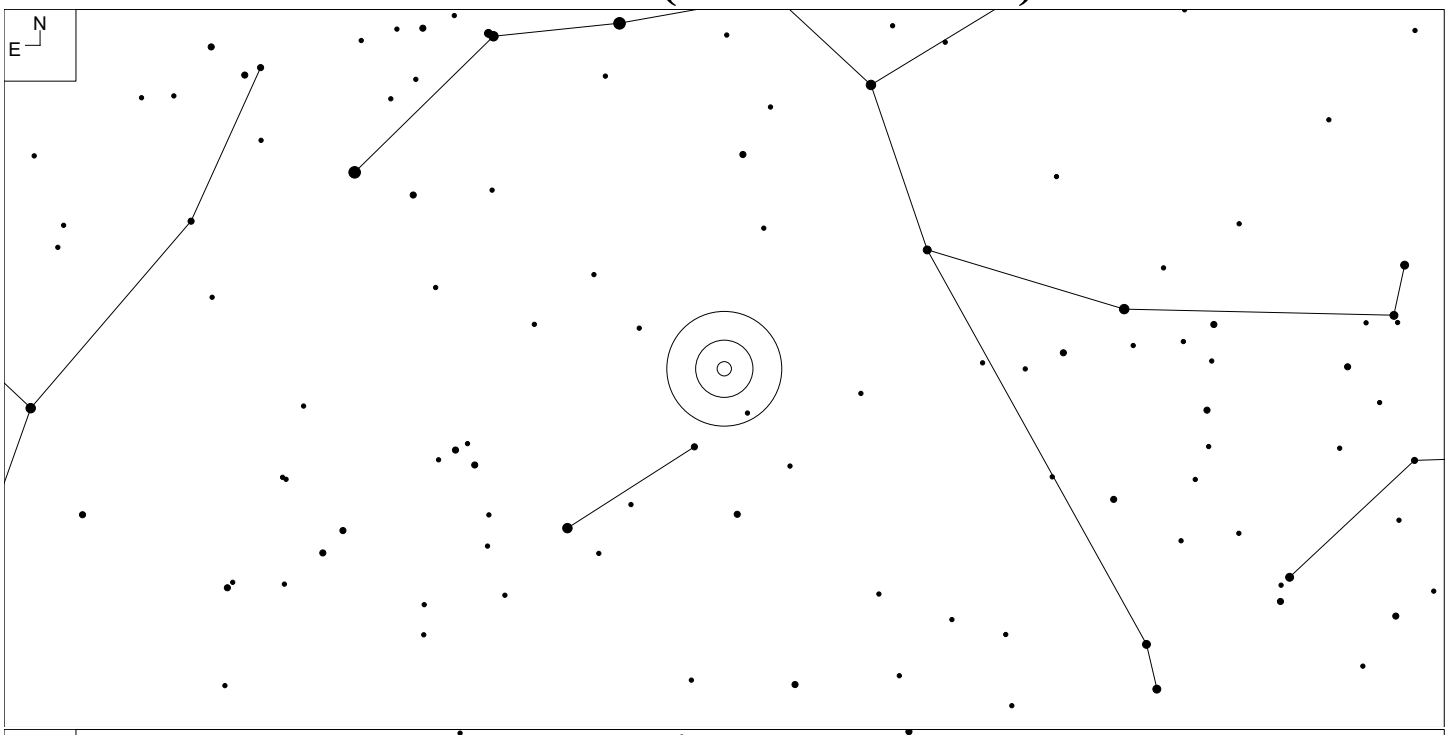


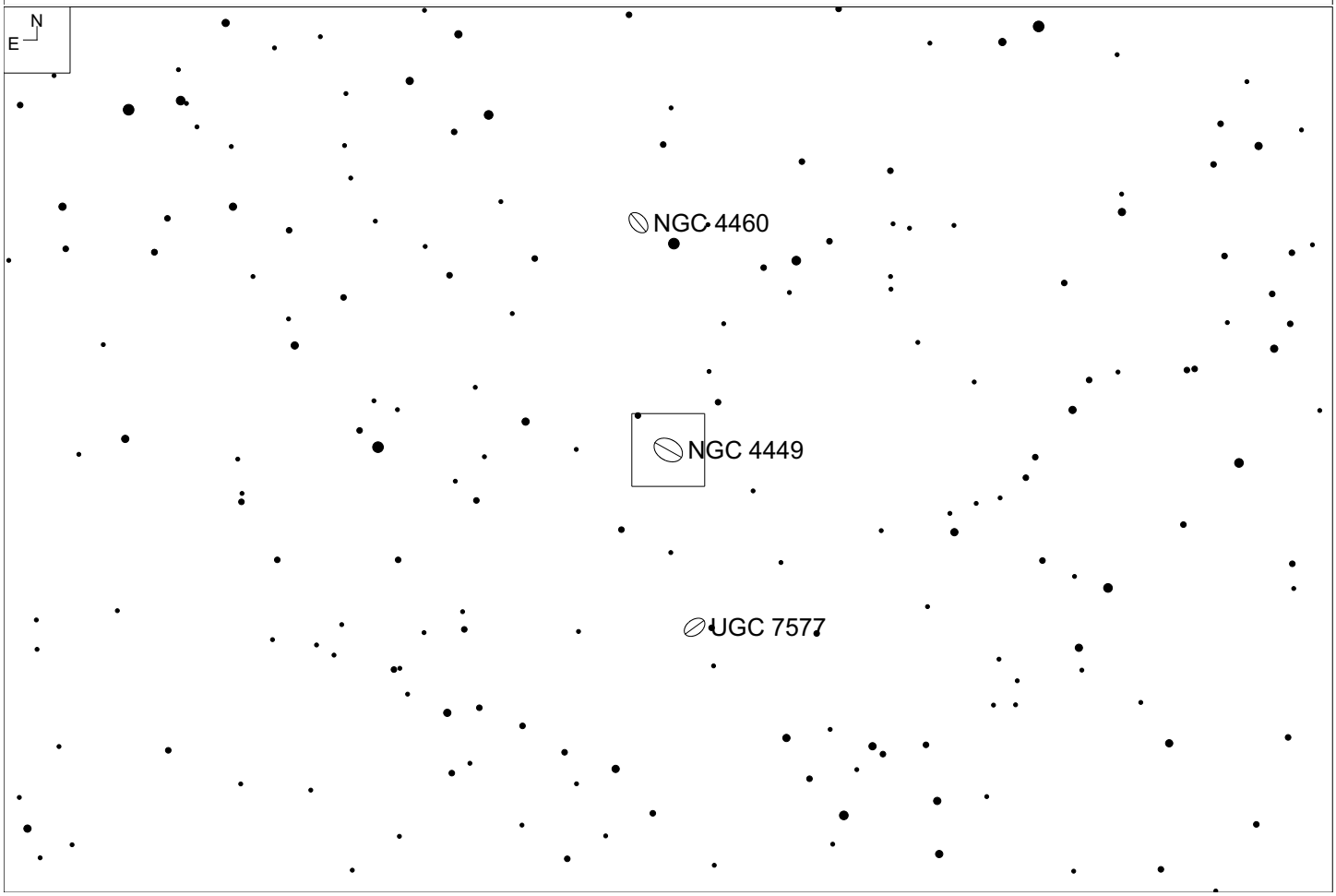




Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG+4-29-60	12 17 34.1	+22 32 27	14.2b	5.5’ x 0.3’	Gal	72	33

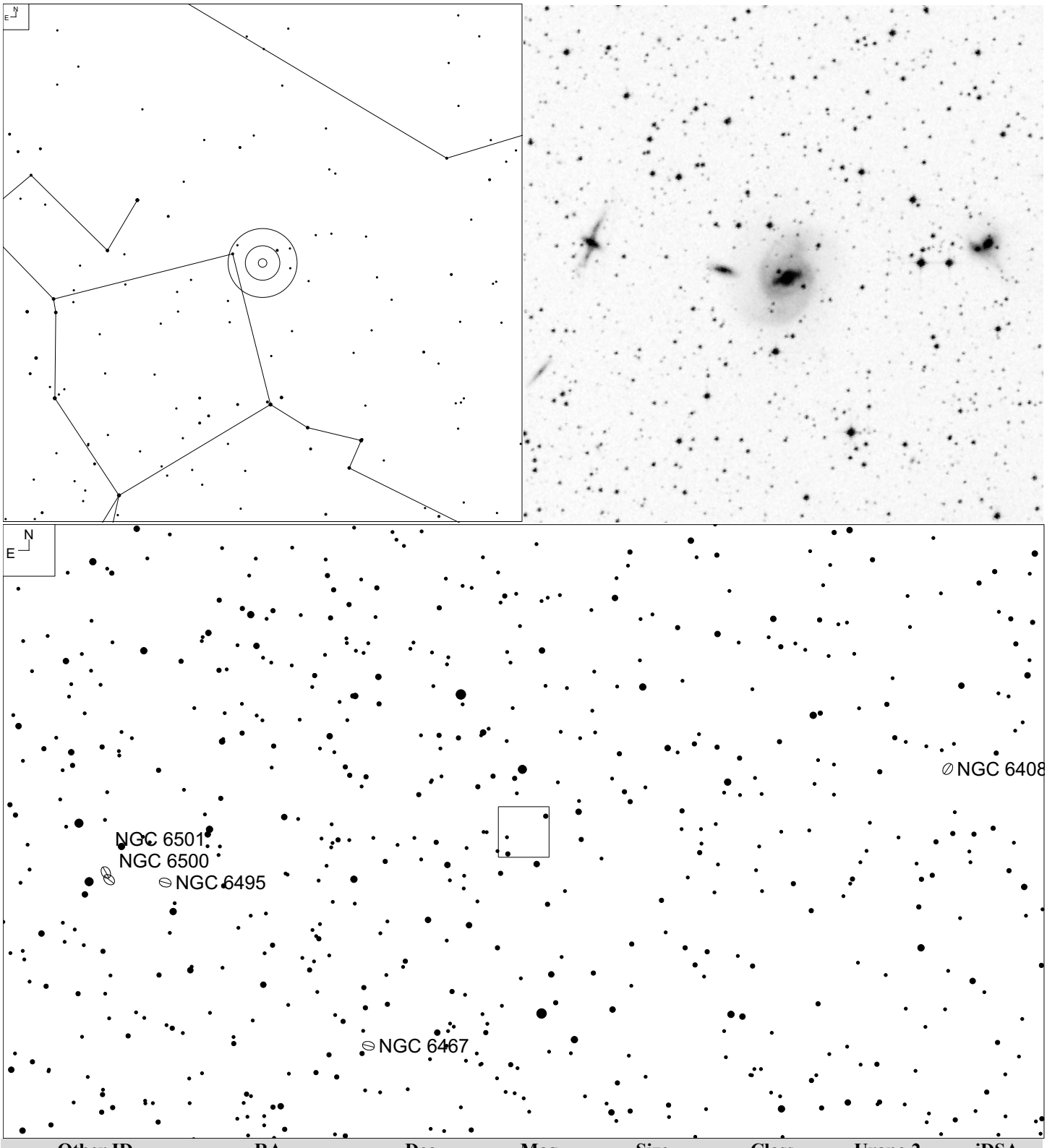
NGC 4449 (Canes Venatici)





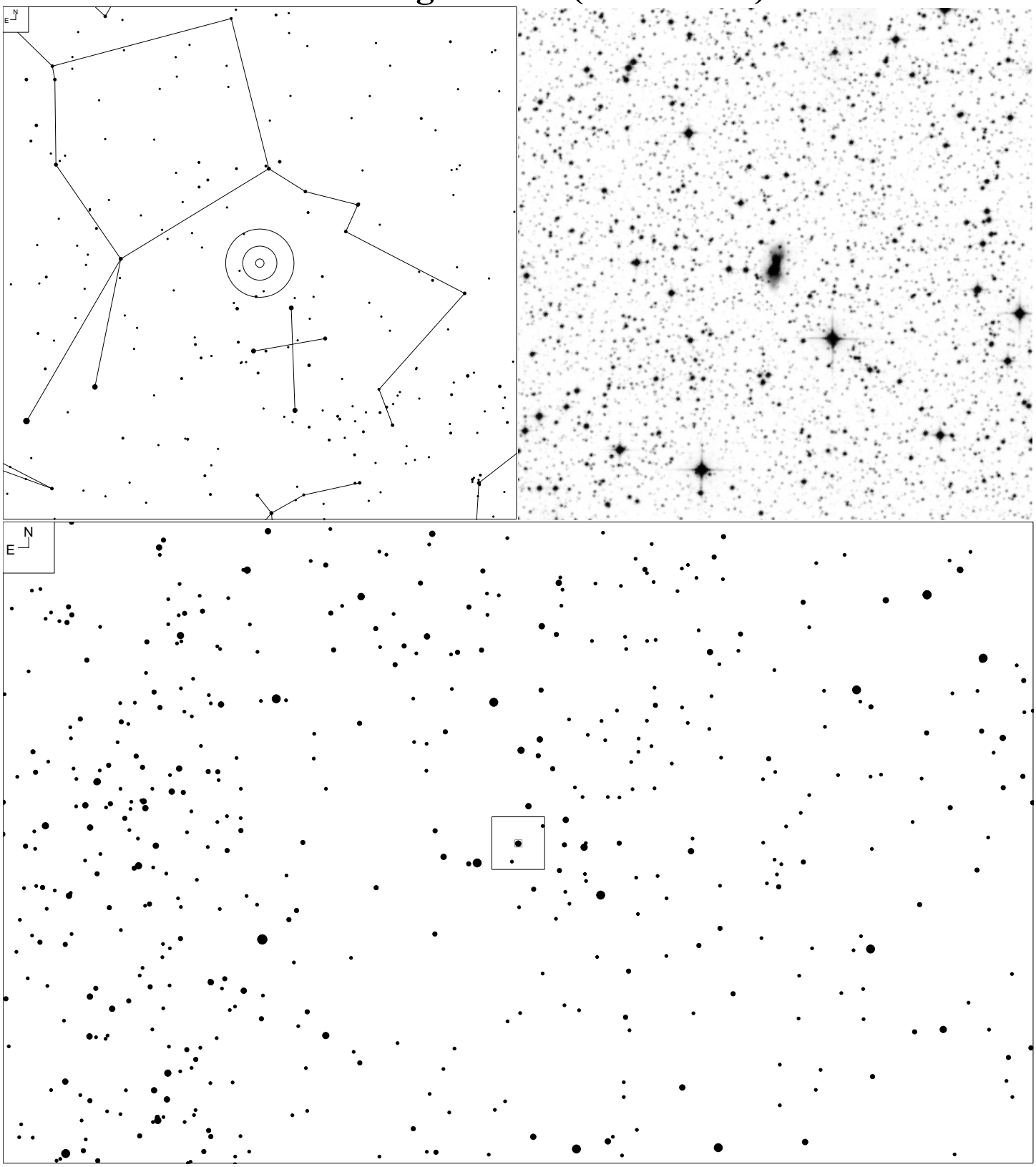
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
	12 28 11.1	-44 05 37	9.6v	6.1 x 4.3’		37	21

Centaurus Chain



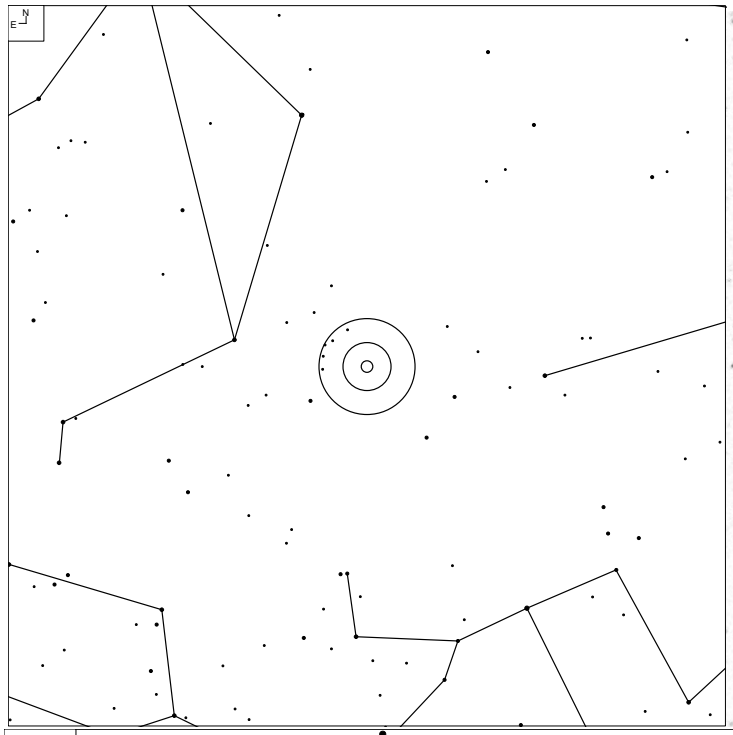
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
NGC4622A	12 43 49.3	-40 42 55	14.5b	0.6’ x 0.5’	GX	167, A23	93
NGC4622B	12 43 51.4	-40 43 04	4.96b	1.4’ x 0.5’	GX		
NGC4650	12 44 19.5	-40 43 54	11.91v	2.0’ x 1.8’	GX		
PGC42911	12 44 29.1	-40 43 39	15.3v	0.8’ x 0.3’	GX		
NGC4650A	12 44 49.2	-40 42 52	13.58v	1.8’ x 0.2’	GX		

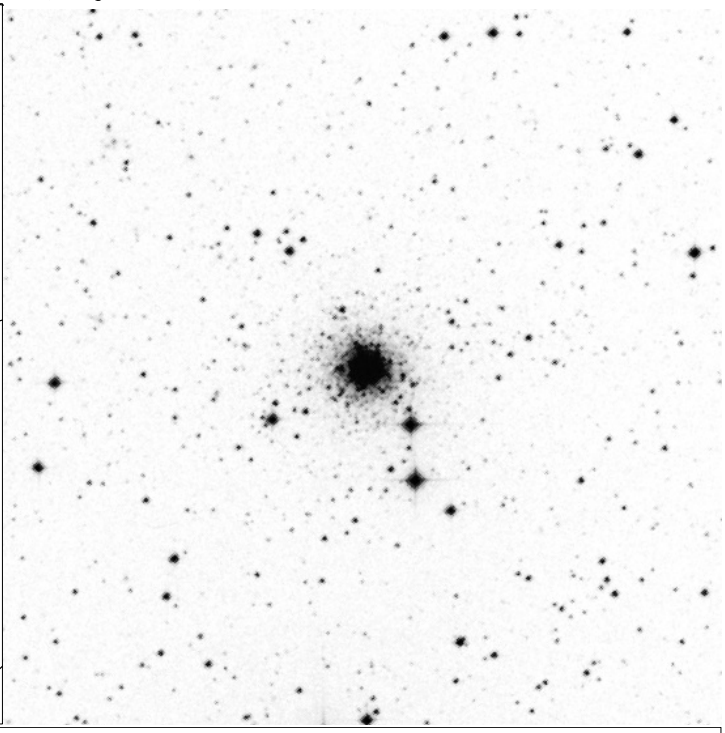
Boomerang Nebula (Centaurus)

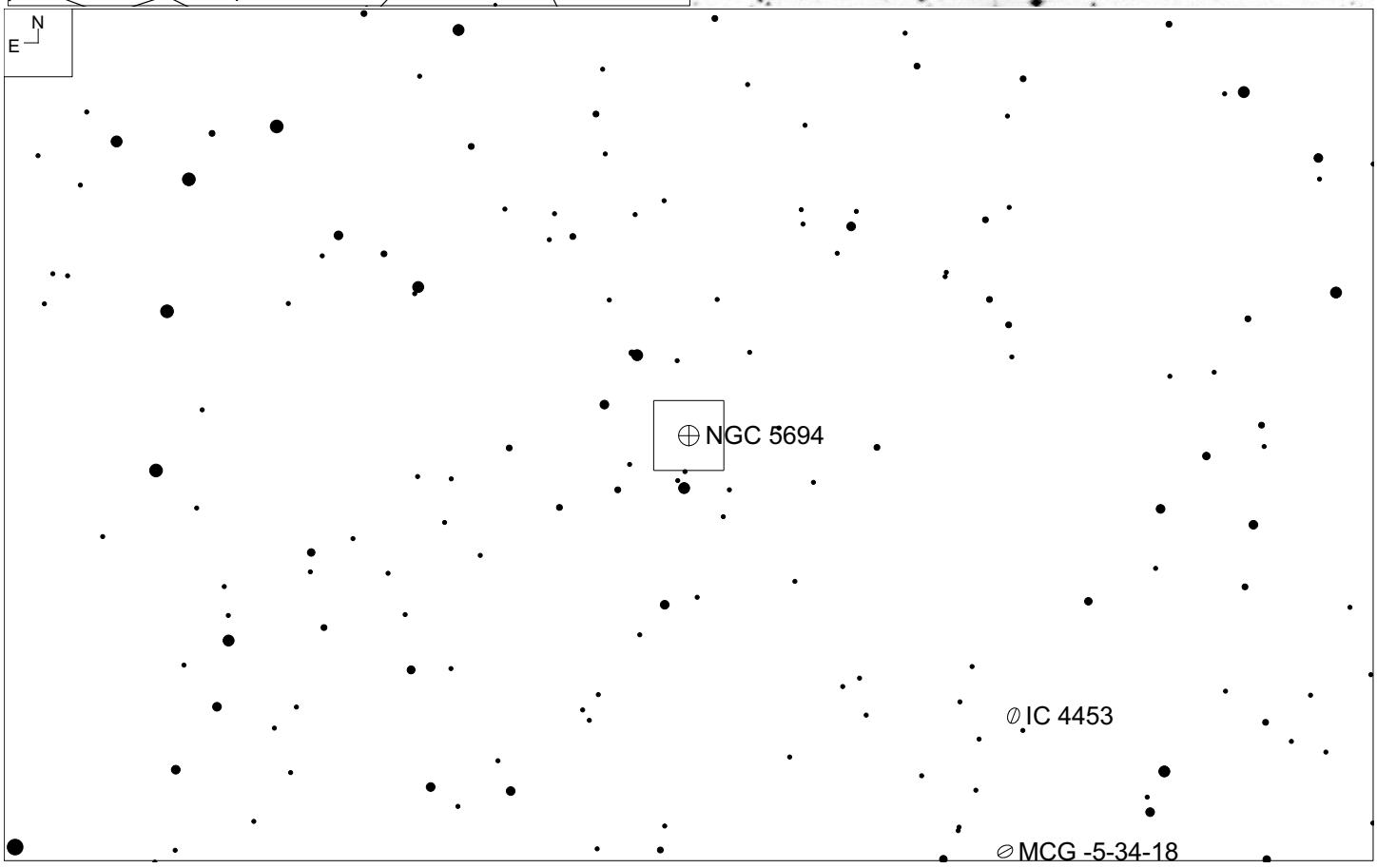


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
ESO 172-7	12 44 46.3	-54 31 10	9.76v	1.4’ x 0.6’	PPN	198	103

NGC 5694 (Hydra)

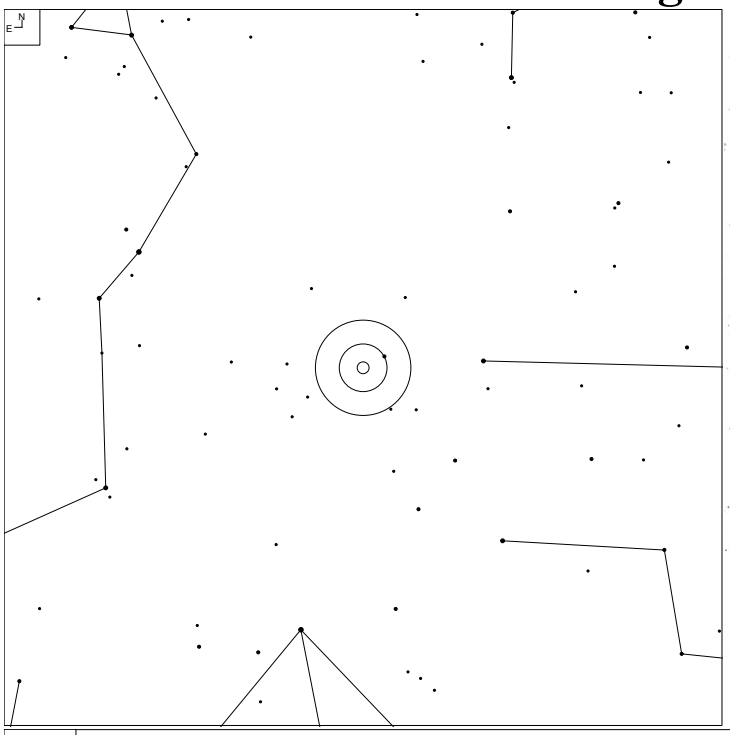


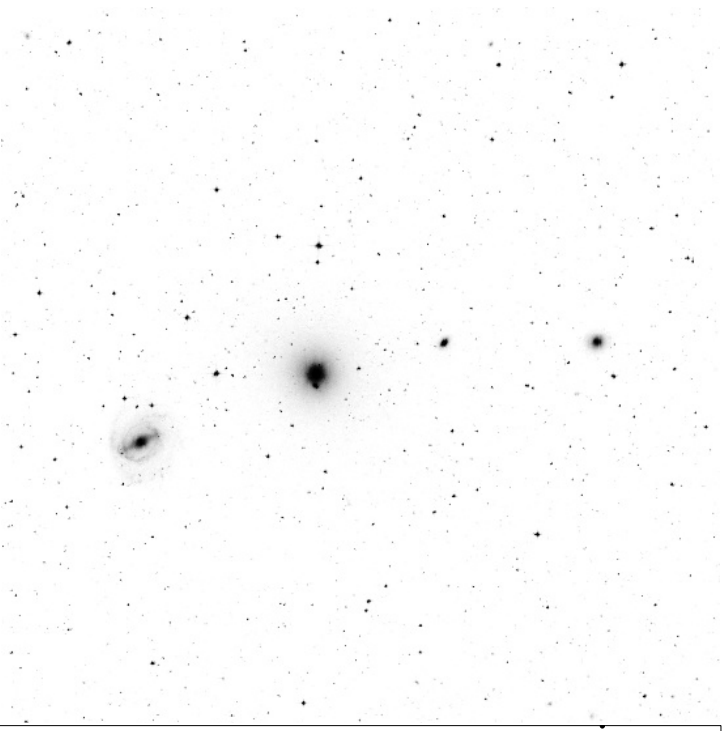


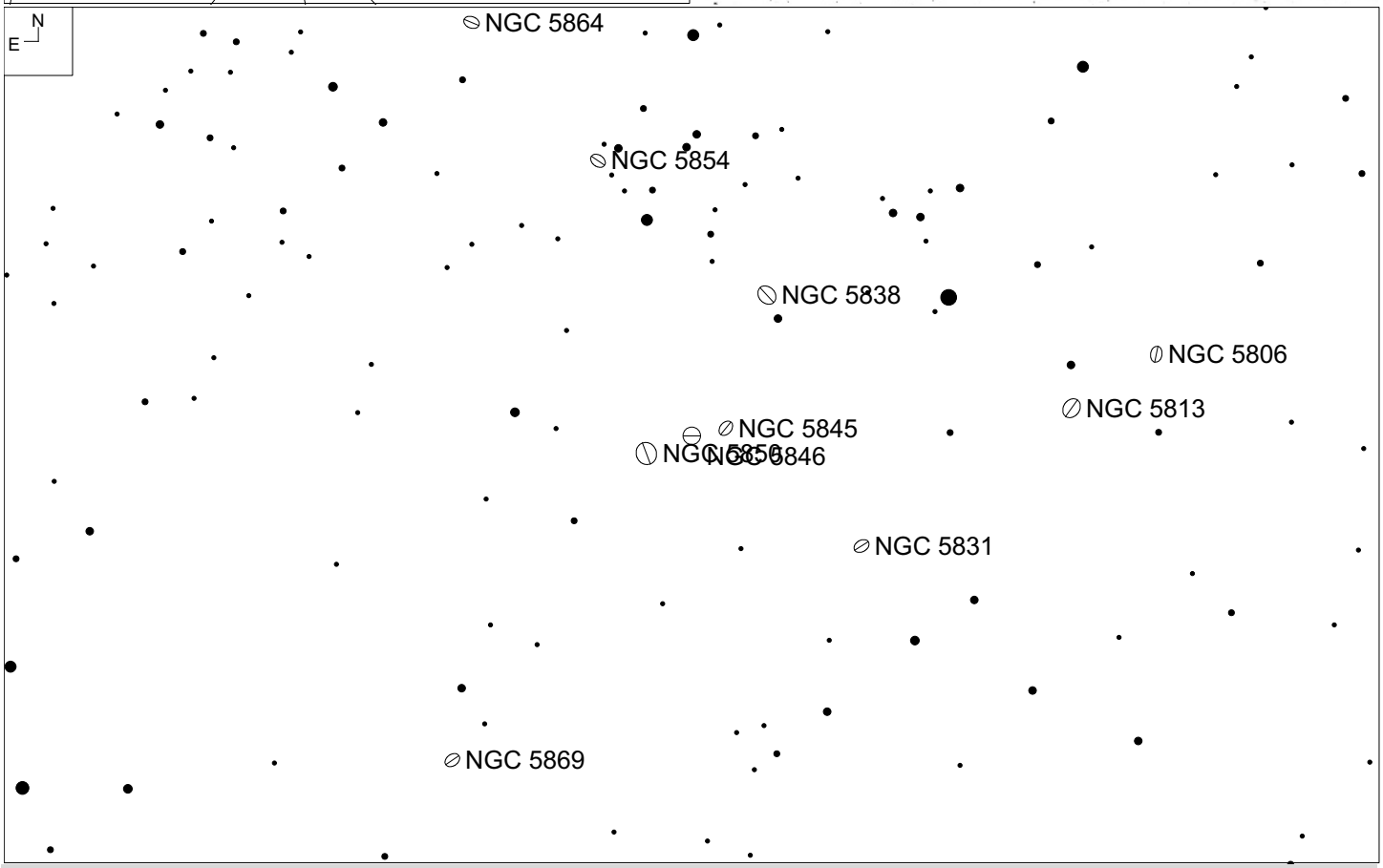


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Caldwell 66	14 39 36.5	-26 32 18	10.2v	4.3’ x 1.3’	C.G.	148	80

Virgo Chain

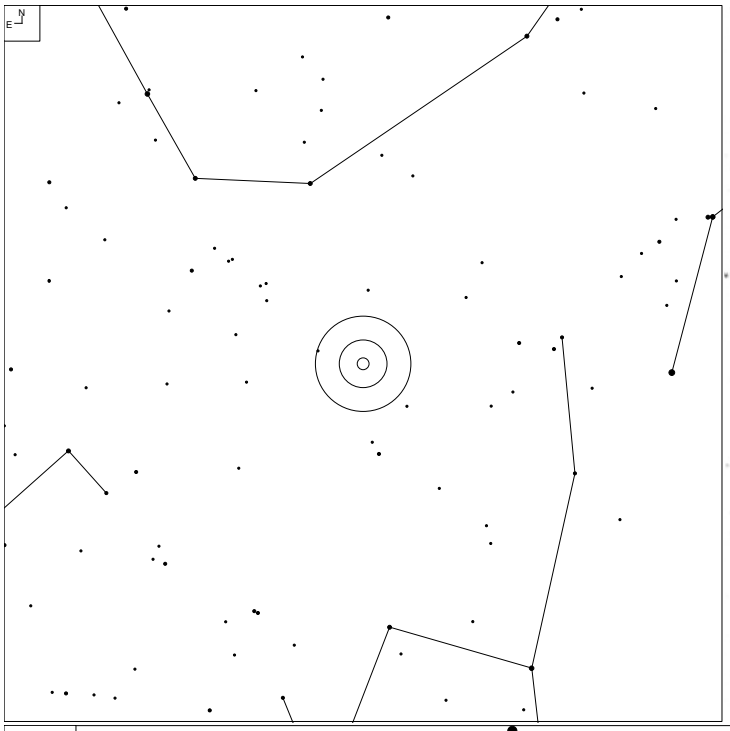


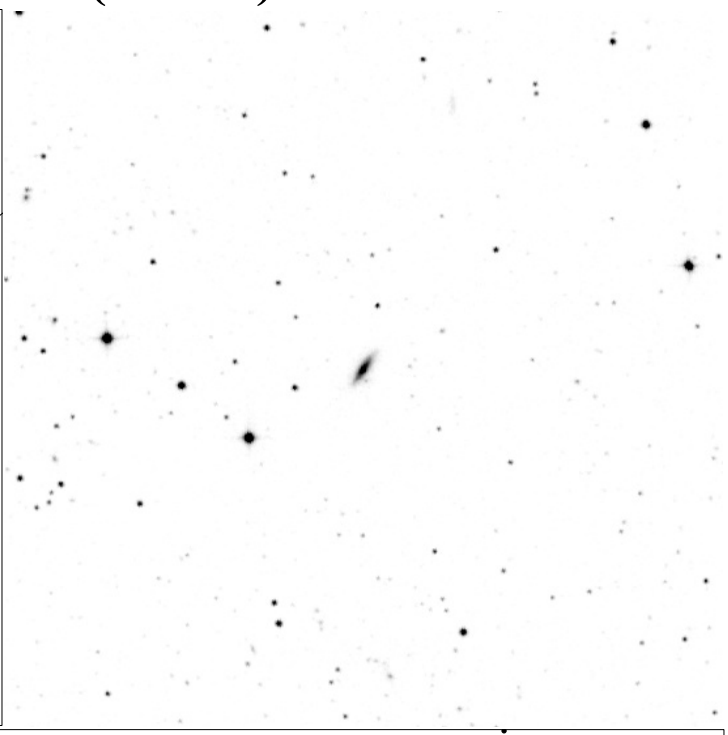


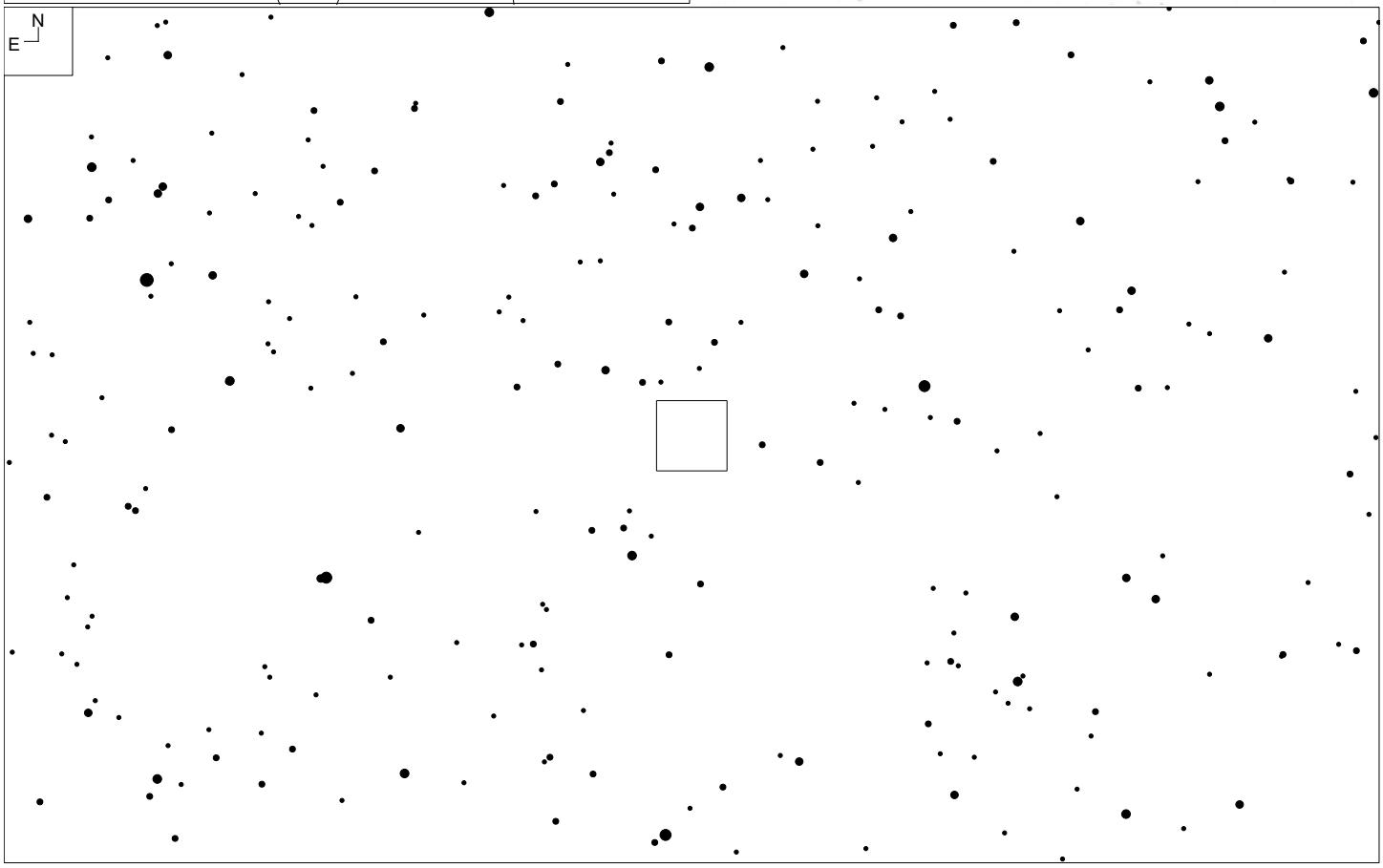


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
NGC5839	15 05 27.1	+01 38 04	12.2v	1.3; x 1.1’	Gal	108	56
NGC5845	15 06 00.5	+01 37 59	11.2v	0.8’ x 0.5’	Gal		
NGC5846	15 06 29.2	+01 36 23	11.9b	3.5’ x 3.5’	Gal		
NGC5846A	15 06 29.1	+01 35 41	13.8v	0.4 x 0.3’	E2-3		
NGC5850	15 07 07.3	+01 32 39	11.5b	4.6’ x 4.1’	Gal		

Markarian 845 (Boötes)

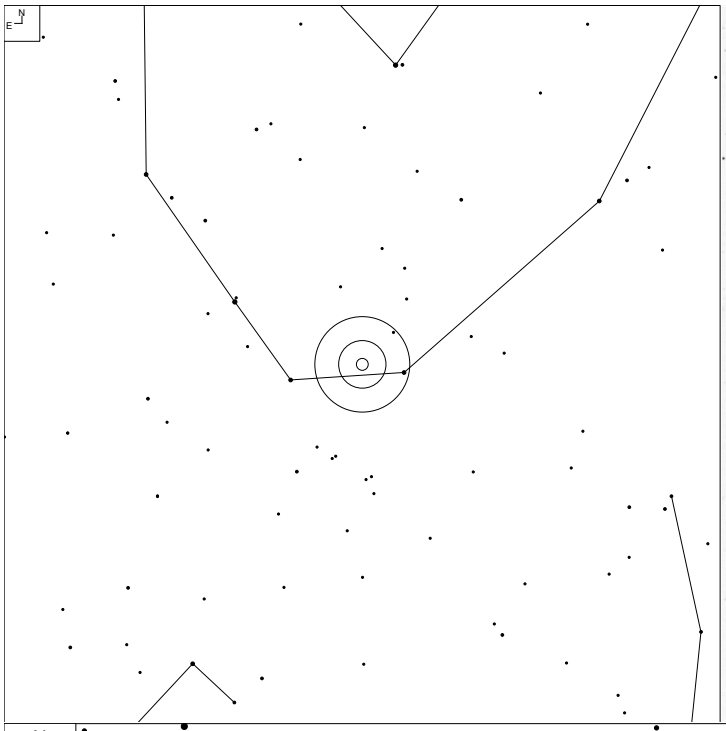


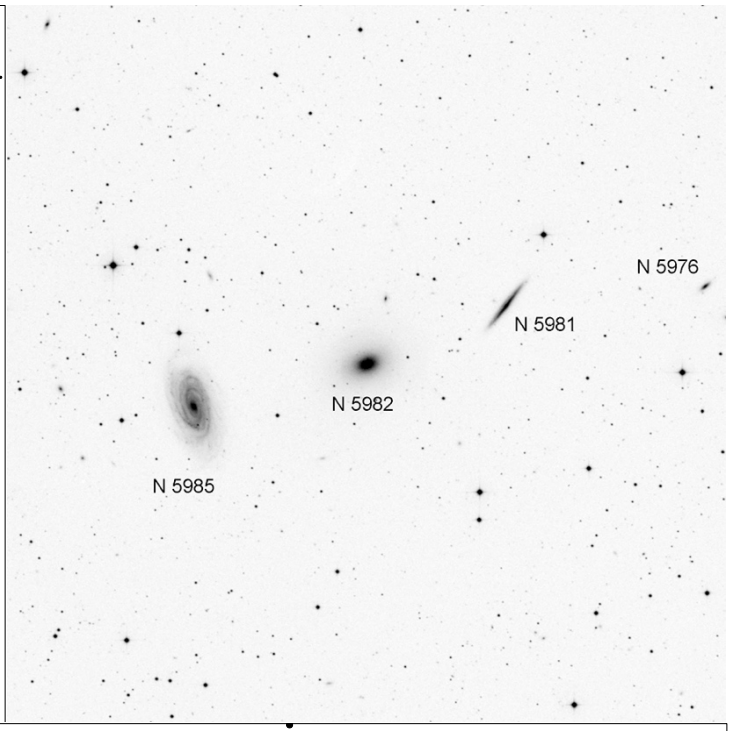


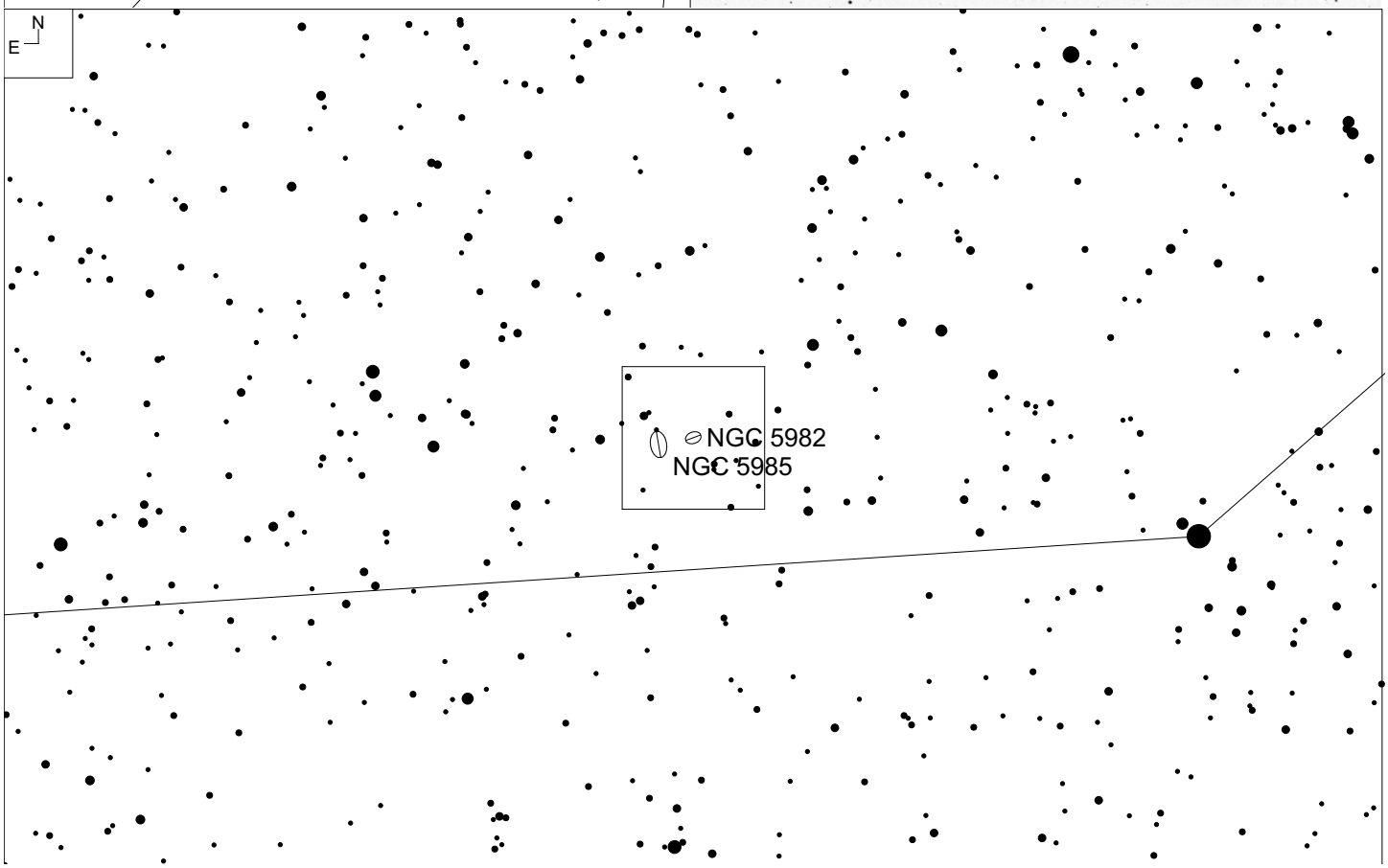


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
MCG +9-25-22	15 07 45.0	+51 27 10	15.4	1.0’ x 0.3’	Gal	35	20

Draco Trio

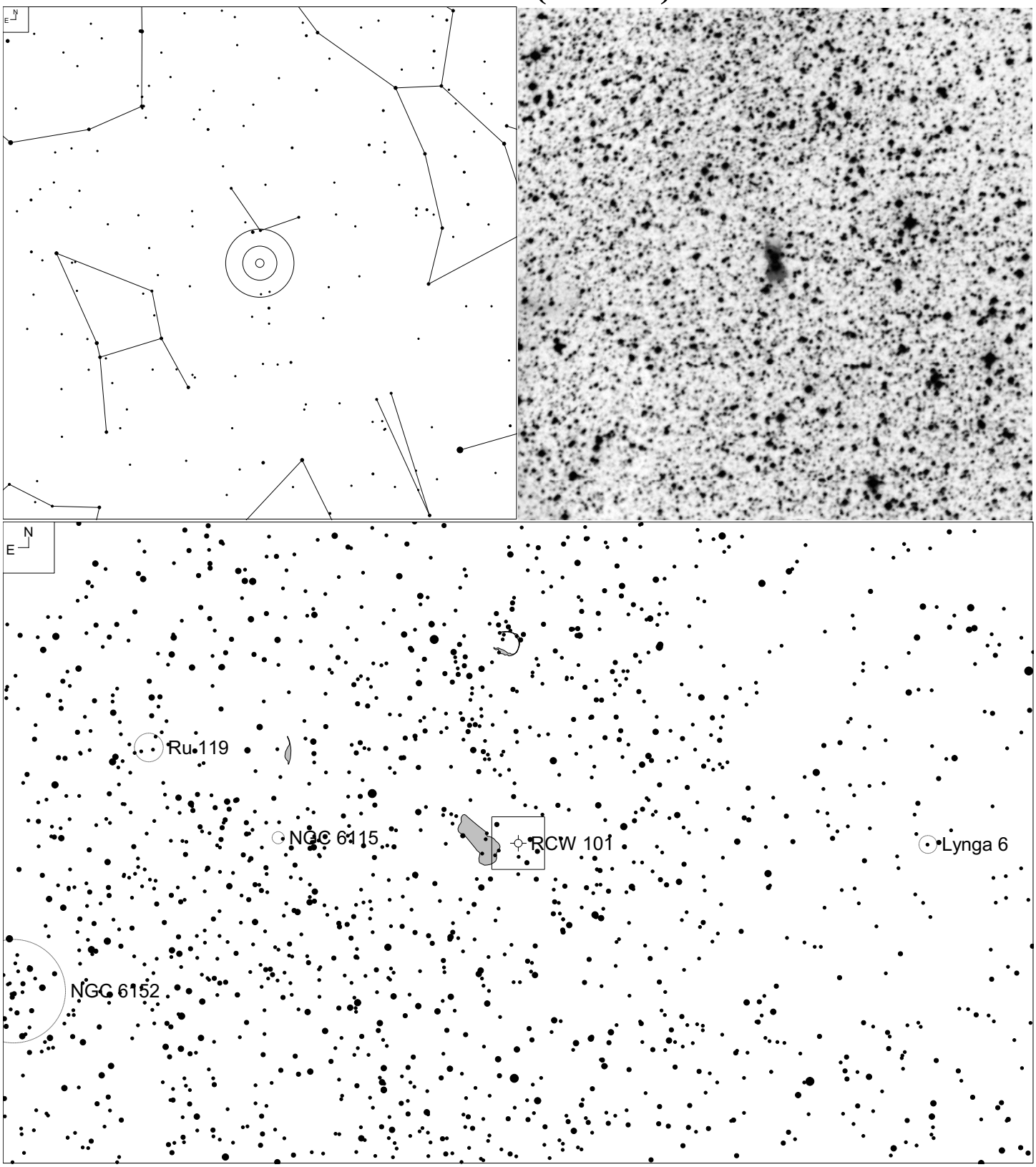






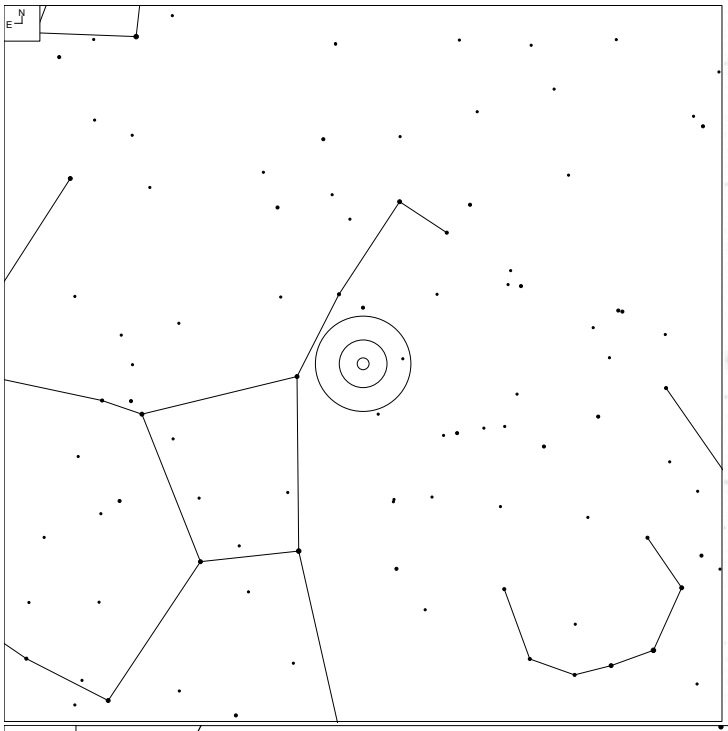
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
NGC5981	15 37 53.3	+59 23 29	14.2b	3.1’ x 0.6’	Gal	22	10
NGC5982	15 38 39.8	+59 21 21	12.4b	2.5’ x 1.8’	Gal		
NGC5985	15 39 37.1	+59 19 55	14.22v	5.5’ x 2.9’	Gal		

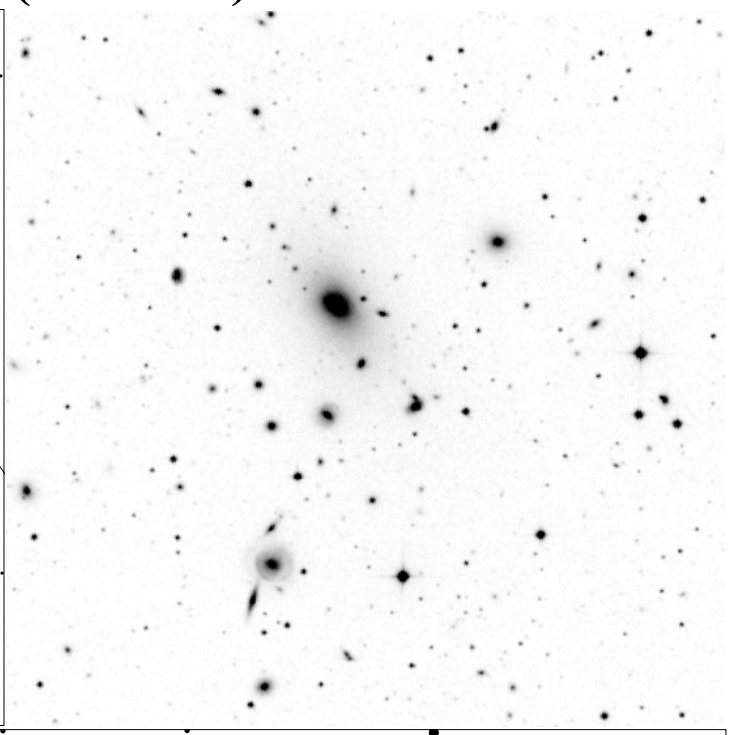
Menzel 3 (Norma)

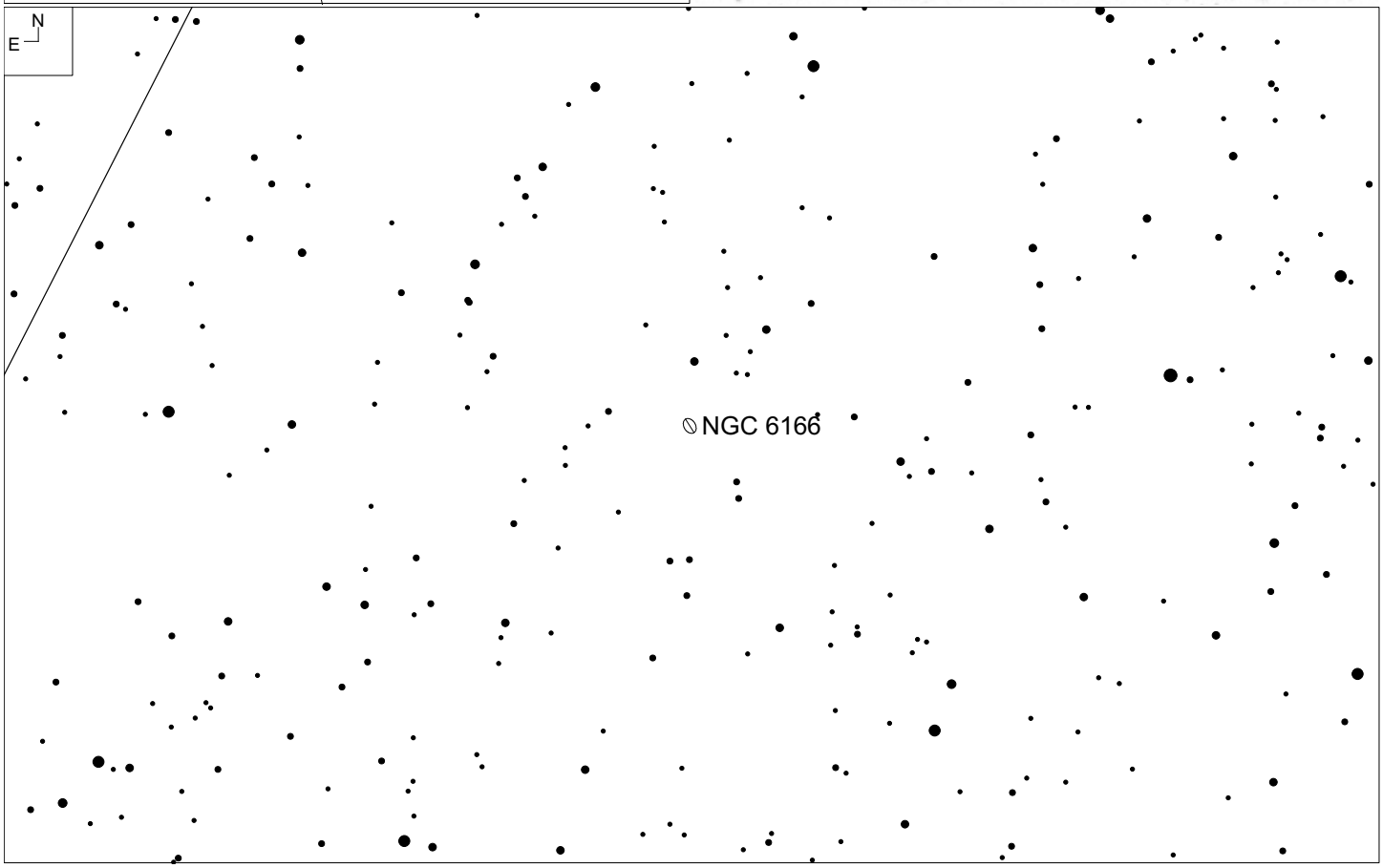


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Ant Nebula	16 17 13.4	-51 59 15	14.0v	25.0”	PN	182	102

Abell 2199 (Hercules)

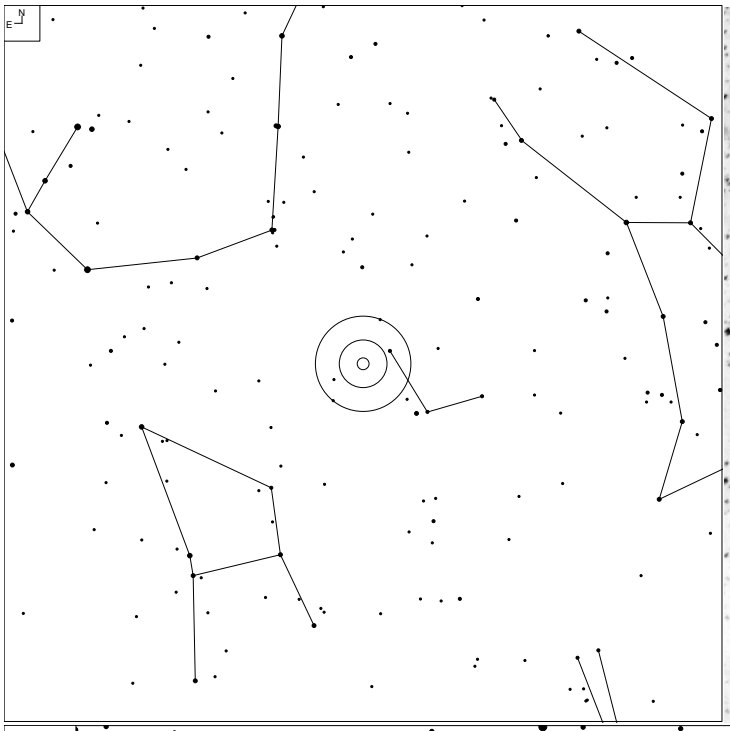


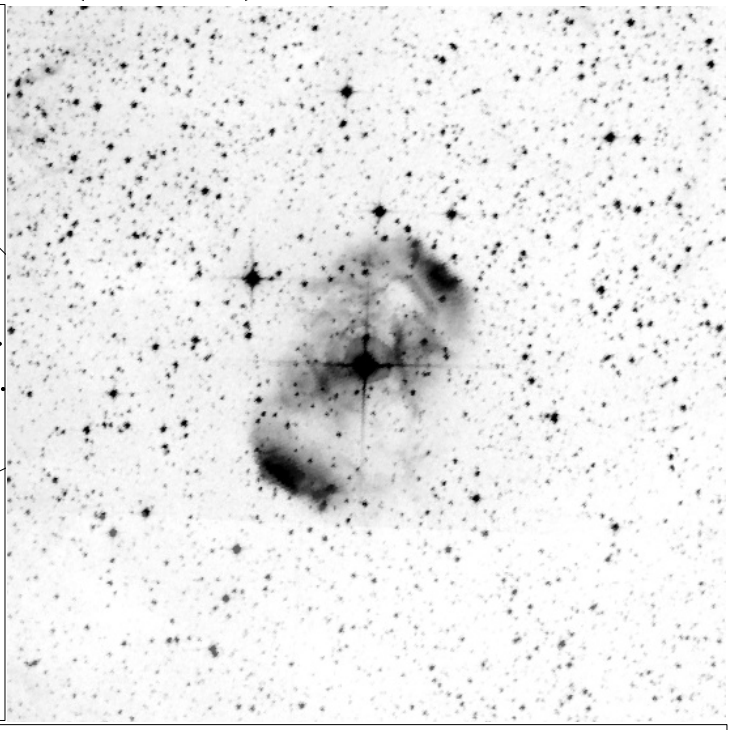


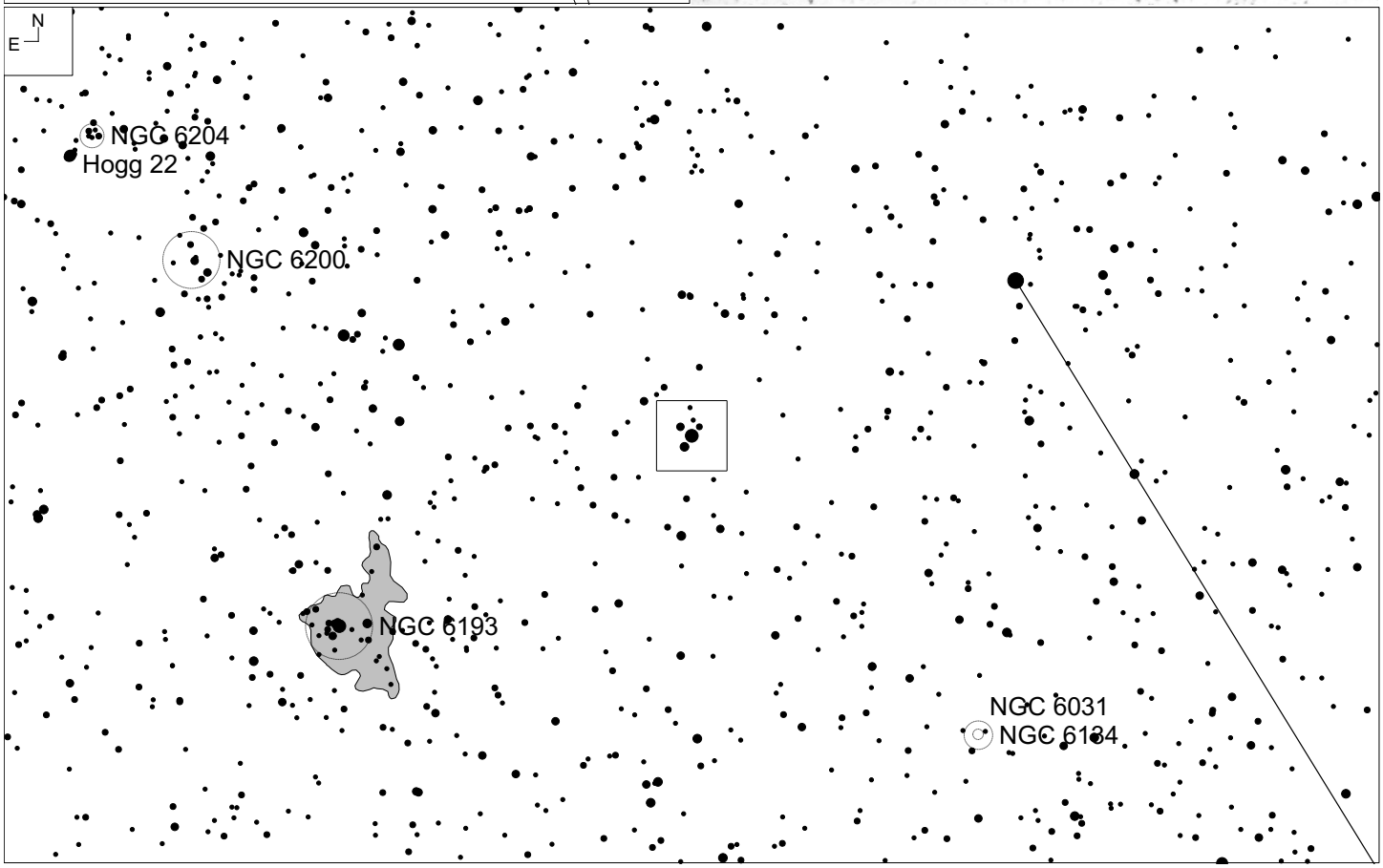


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
NGC6166	16 28 38.5	+39 33 05	--	12’ x 11’	Gal Cluster	51	19

NGC 6164/65 (Norma)

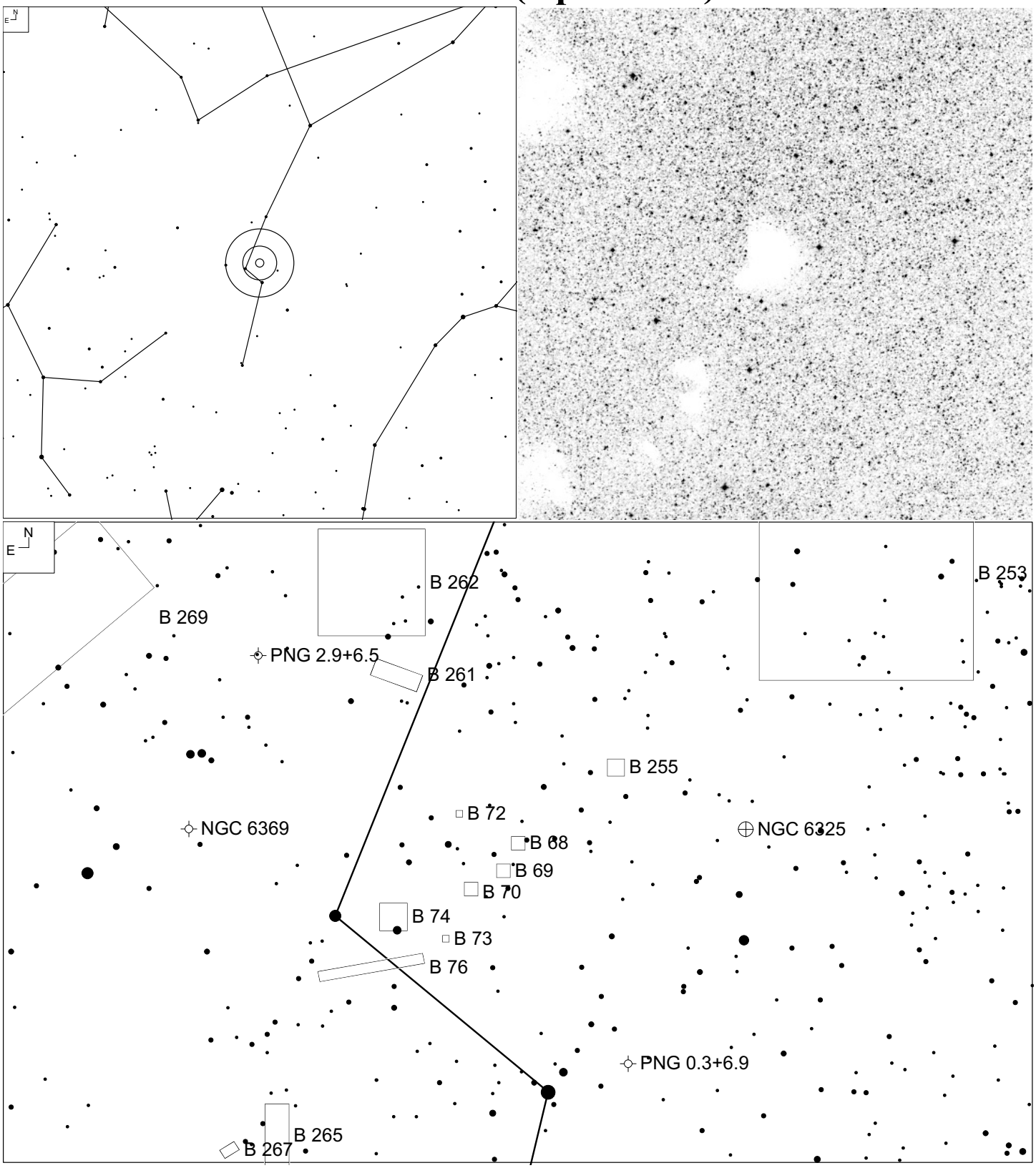






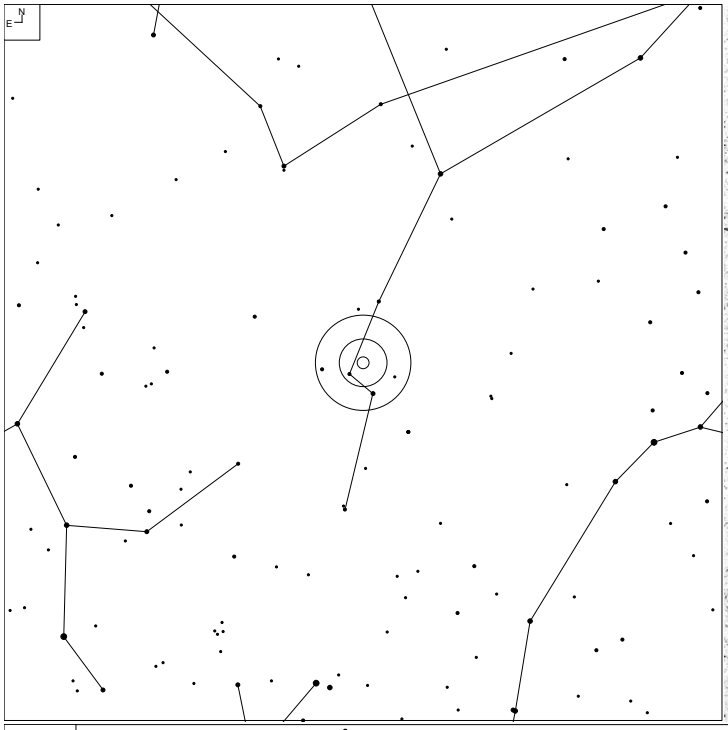
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
PK 336-00-1	16 33 52.6	-48 06 40	6.71v	3.0’ x 3.0’	ENeb	182	91

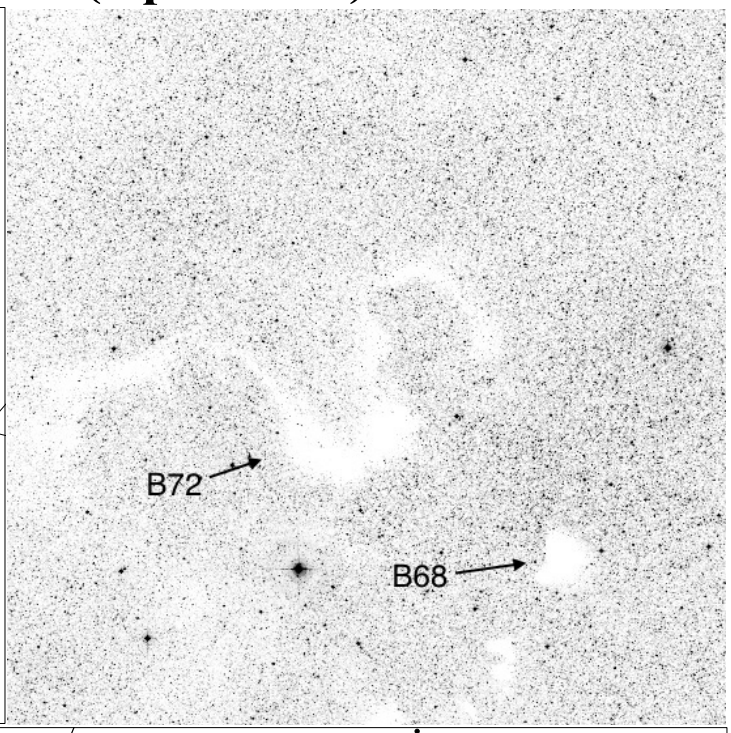
Barnard 68 (Ophiuchus)

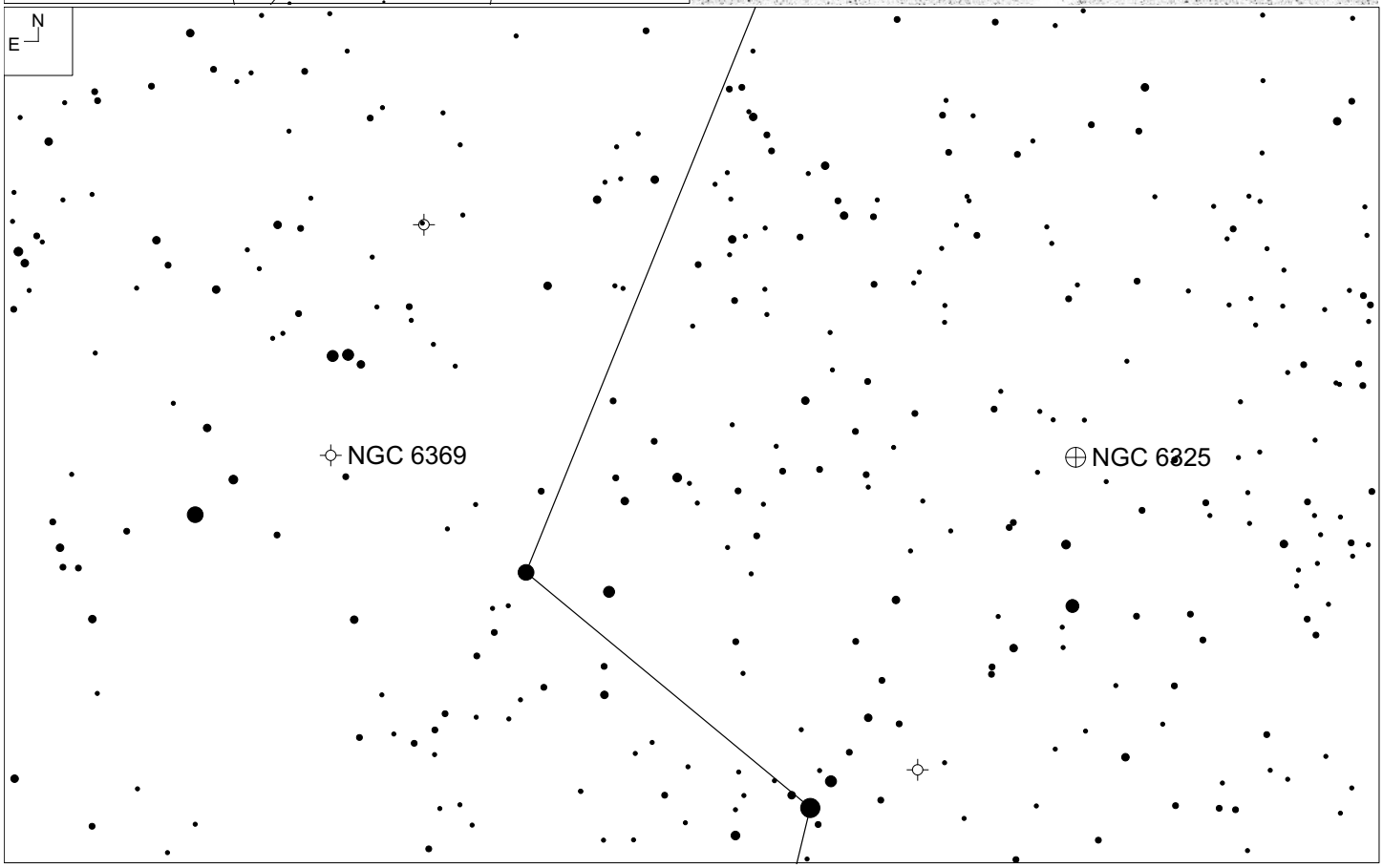


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
LDN 57	17 22 38.2	-23 49 34	--	4.0’ x 4.0’	DNe	146	79

Barnard 68 and 72 (Ophiuchus)

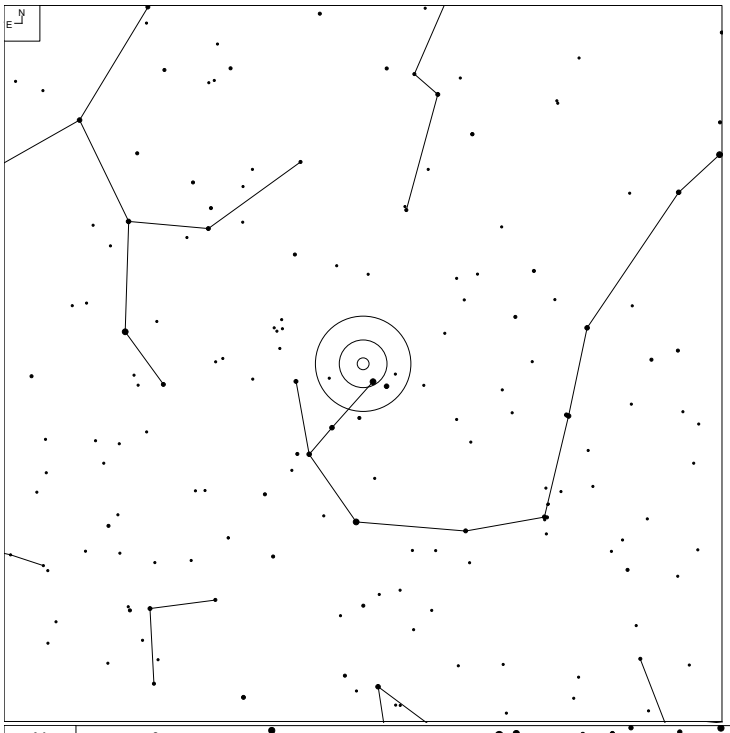


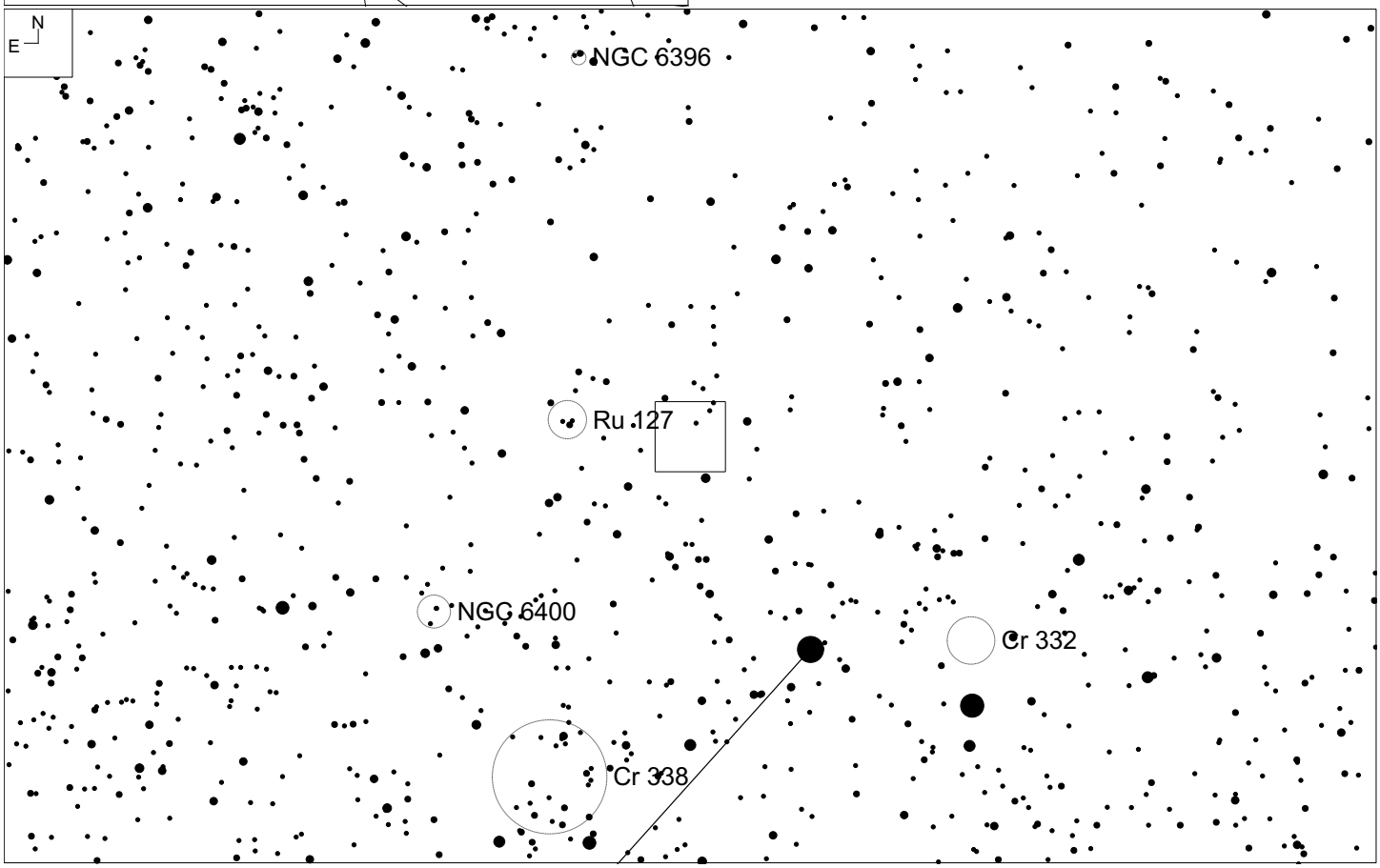




Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Snake Nebula	17 23 50.1	-23 41 51	--	37’ x 17’	DNeb	146	79

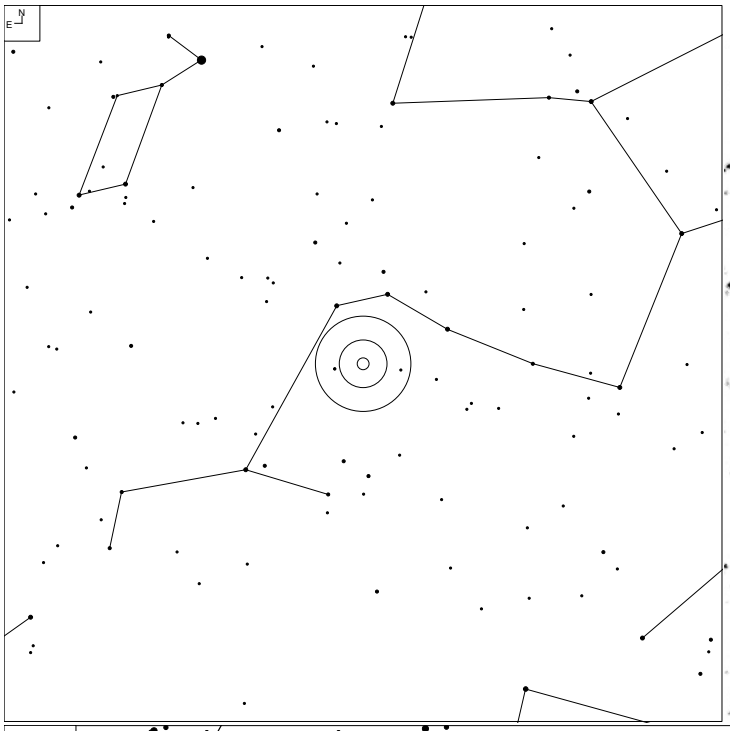
FSR 1767 (Scorpius)

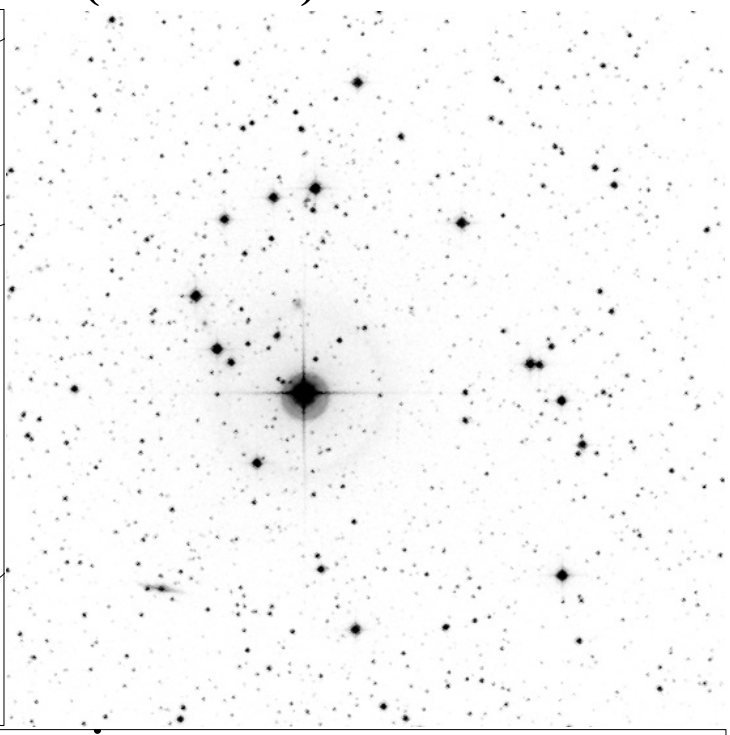


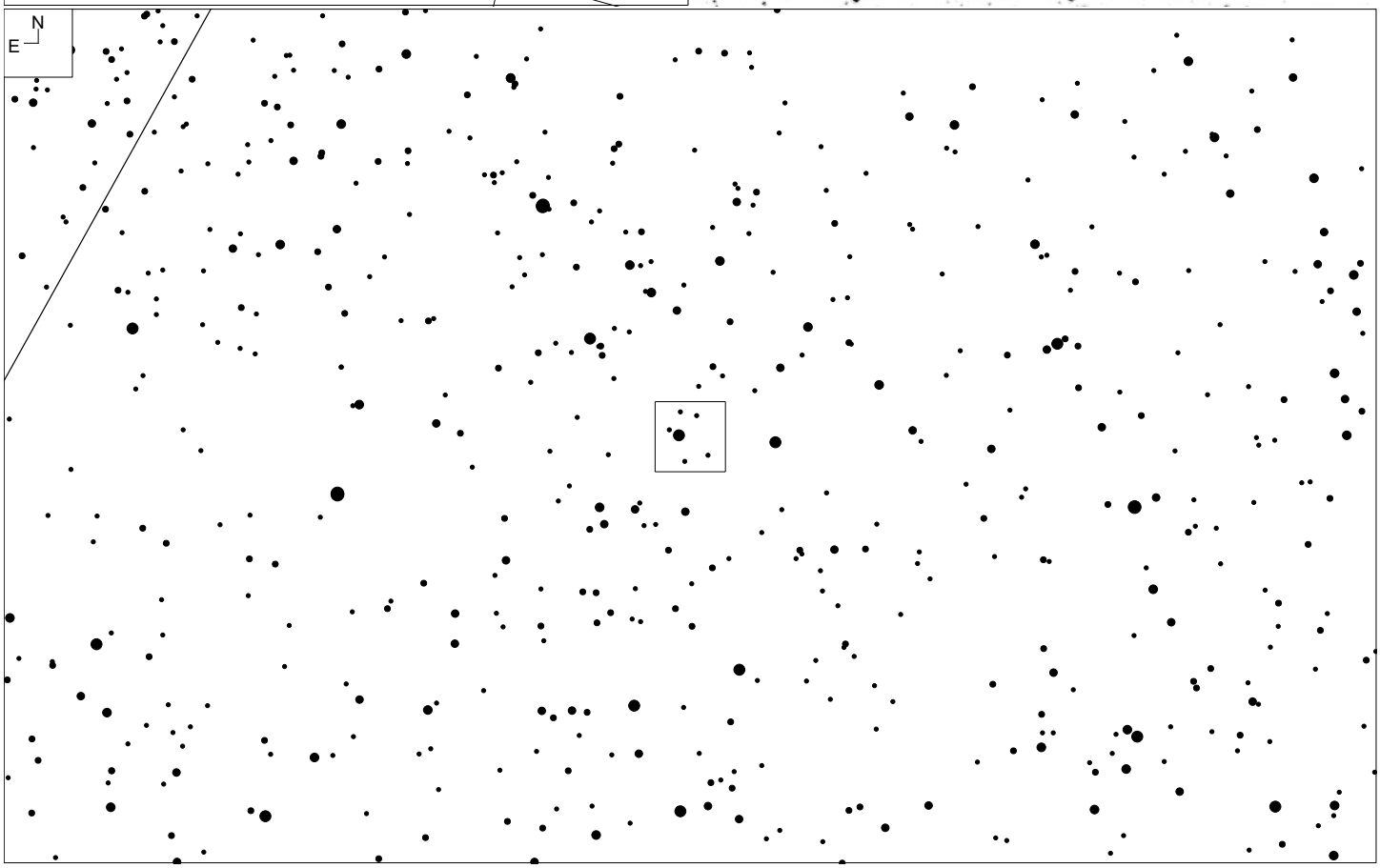


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
	17 35 44.8	-36 21 42	16.5v	8.1 x 5.0’	GC	164	79

Webb's Wreath (Hercules)

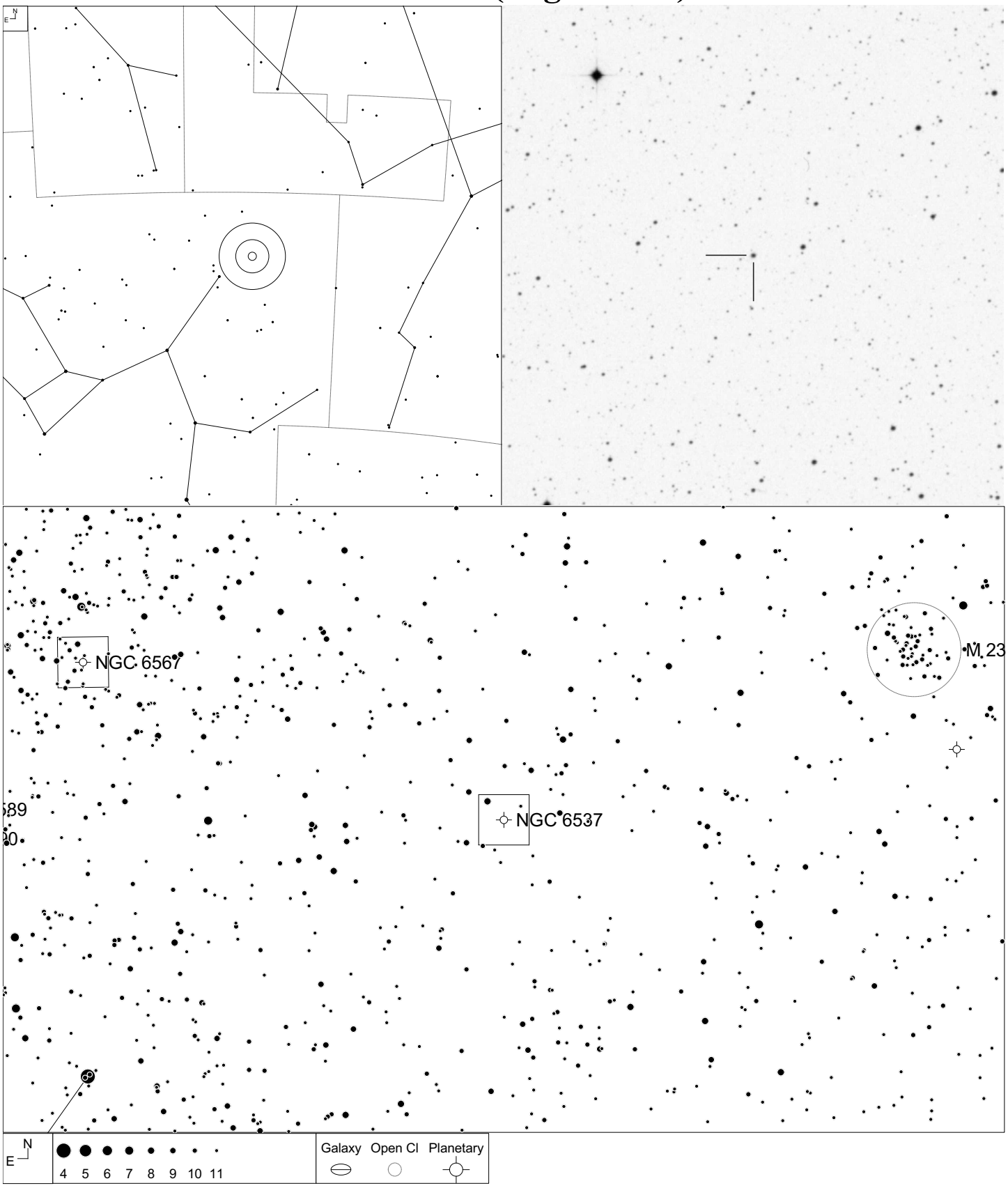






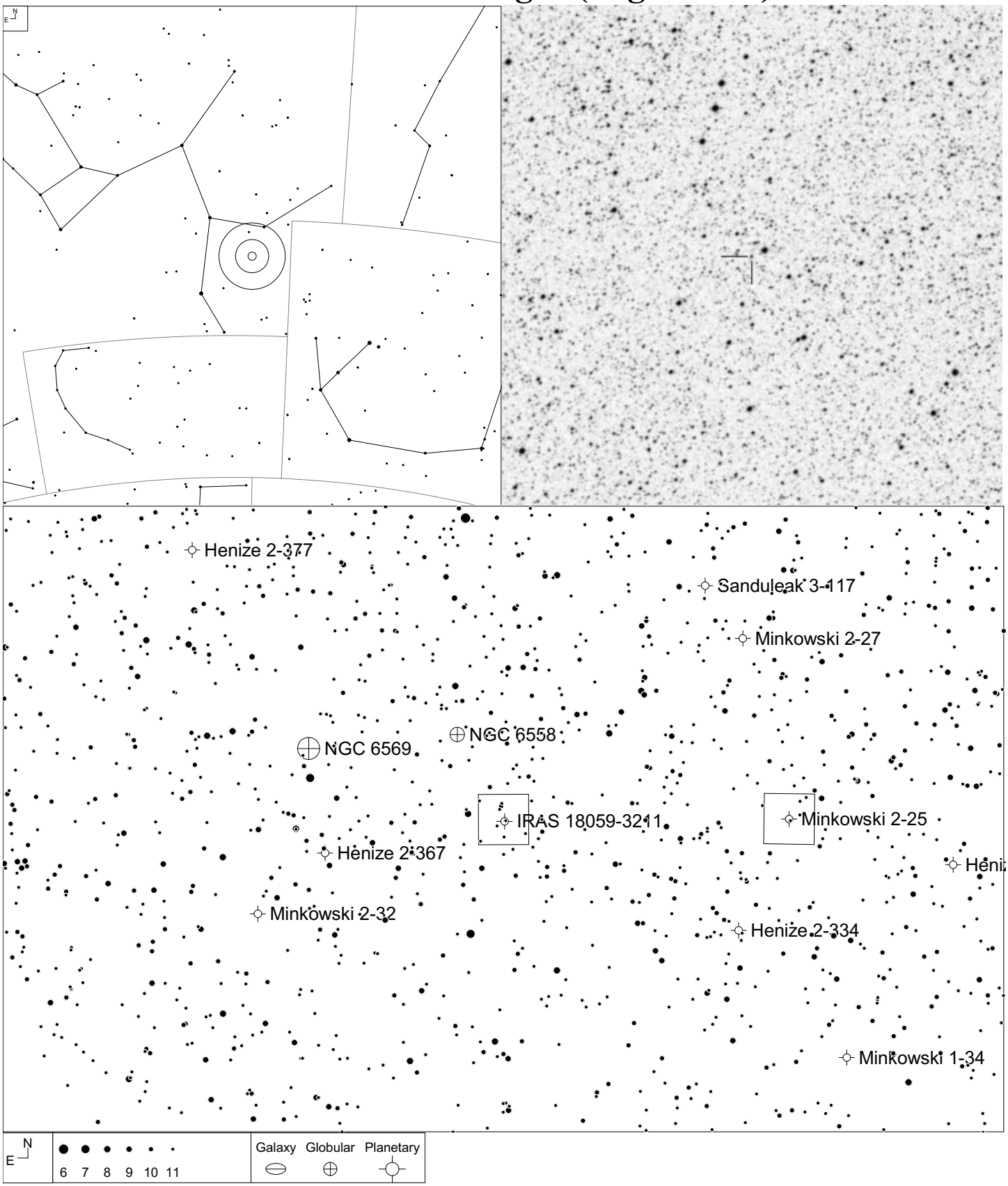
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
HD164922	18 02 29.4	+26 19 19	8.5v	4.9 x 3.4'	Ast	67	90
PGC 1772537	18 02 41.1	+26 20 31	18.2g	5.0"	Gal		
PGC 1768412	18 02 45.9	+26 14 08	15.9g	47.8 x 7.1"	Gal		

NGC 6537 (Sagittarius)



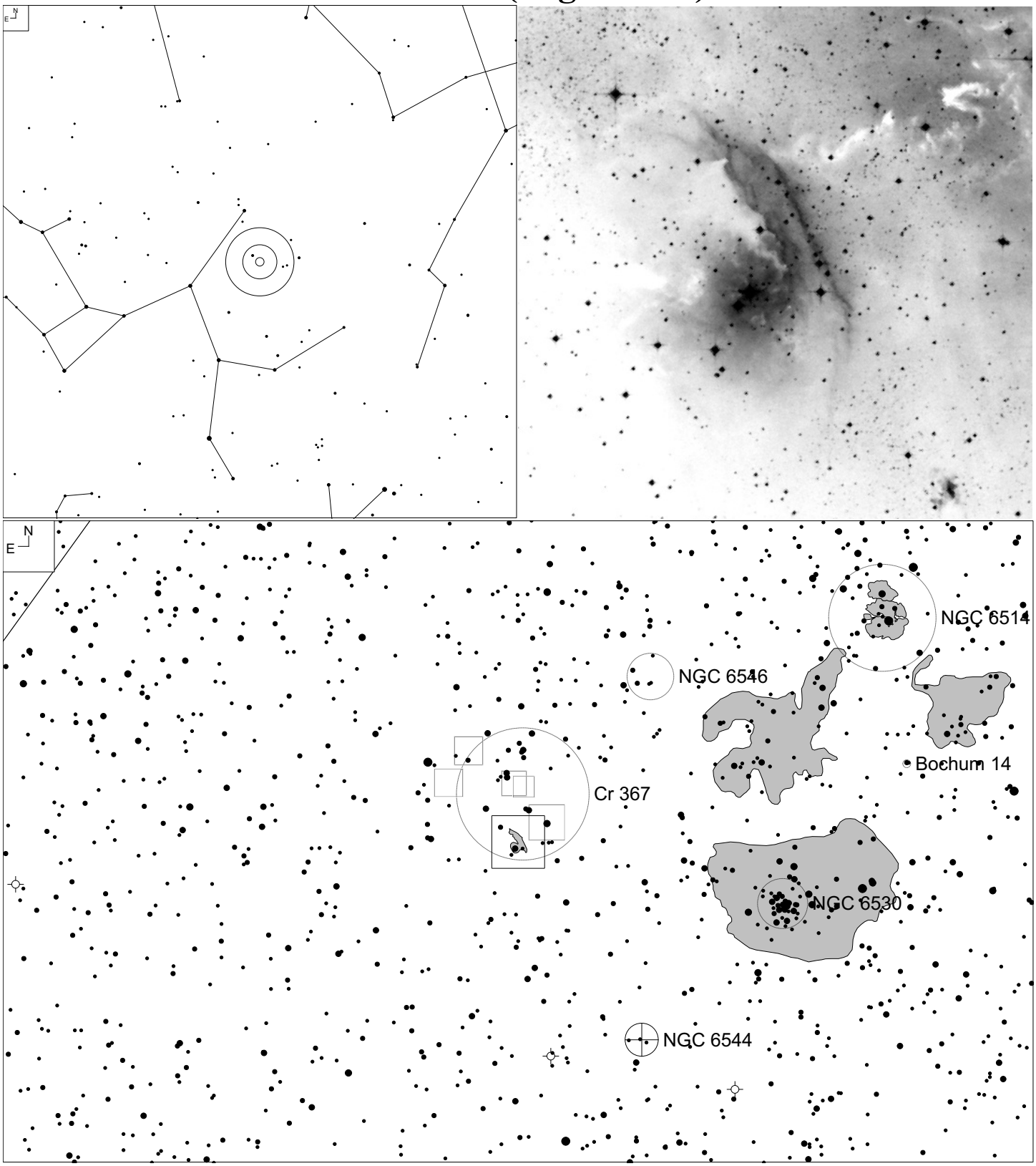
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Red Spider Neb.	18 05 13.1	-19 50 35	13.58v	10.0”	PN	145	66

Gomez's Hamburger (Sagittarius)



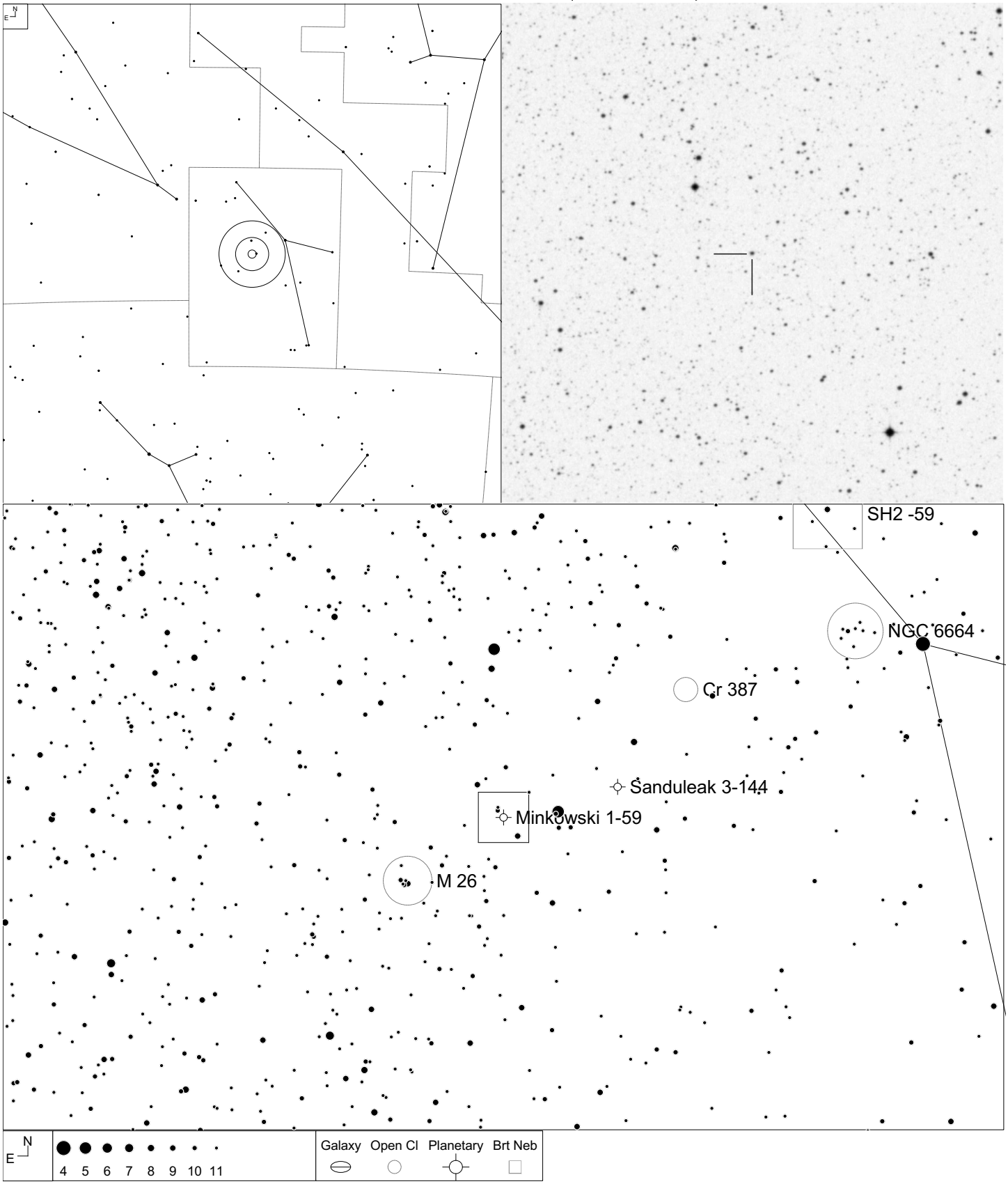
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
IRAS 18059-3211	18 09 13.3	-32 10 48	14.4v	0.5 x 0.3"	PPN	163	78

NGC 6559 (Sagittarius)



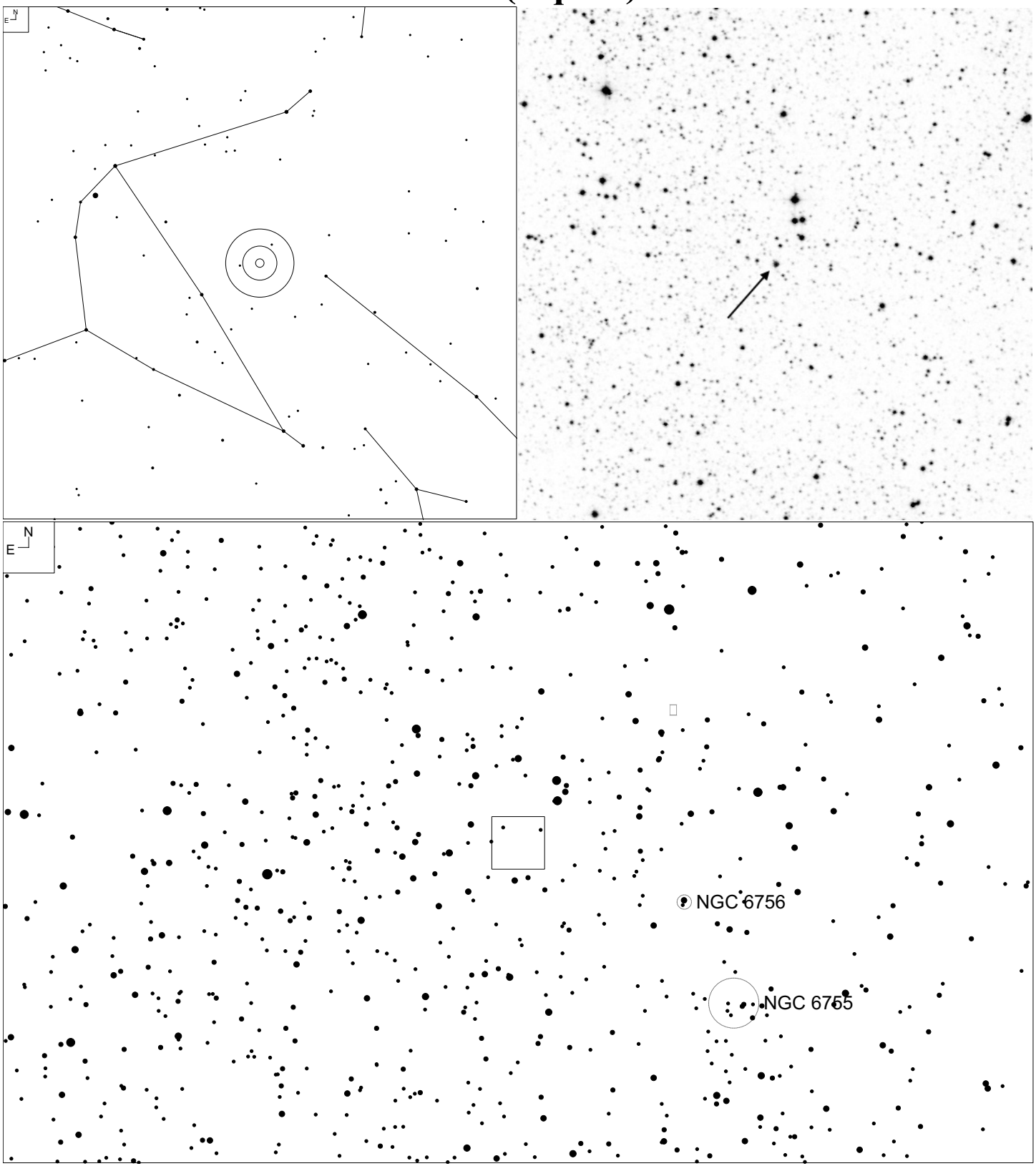
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
ESO 521-40	18 09 53.0	-24 04 30	--	8.3 x 4.2’	ENeb	145	78

Minkowski 1-59 (Scutum)



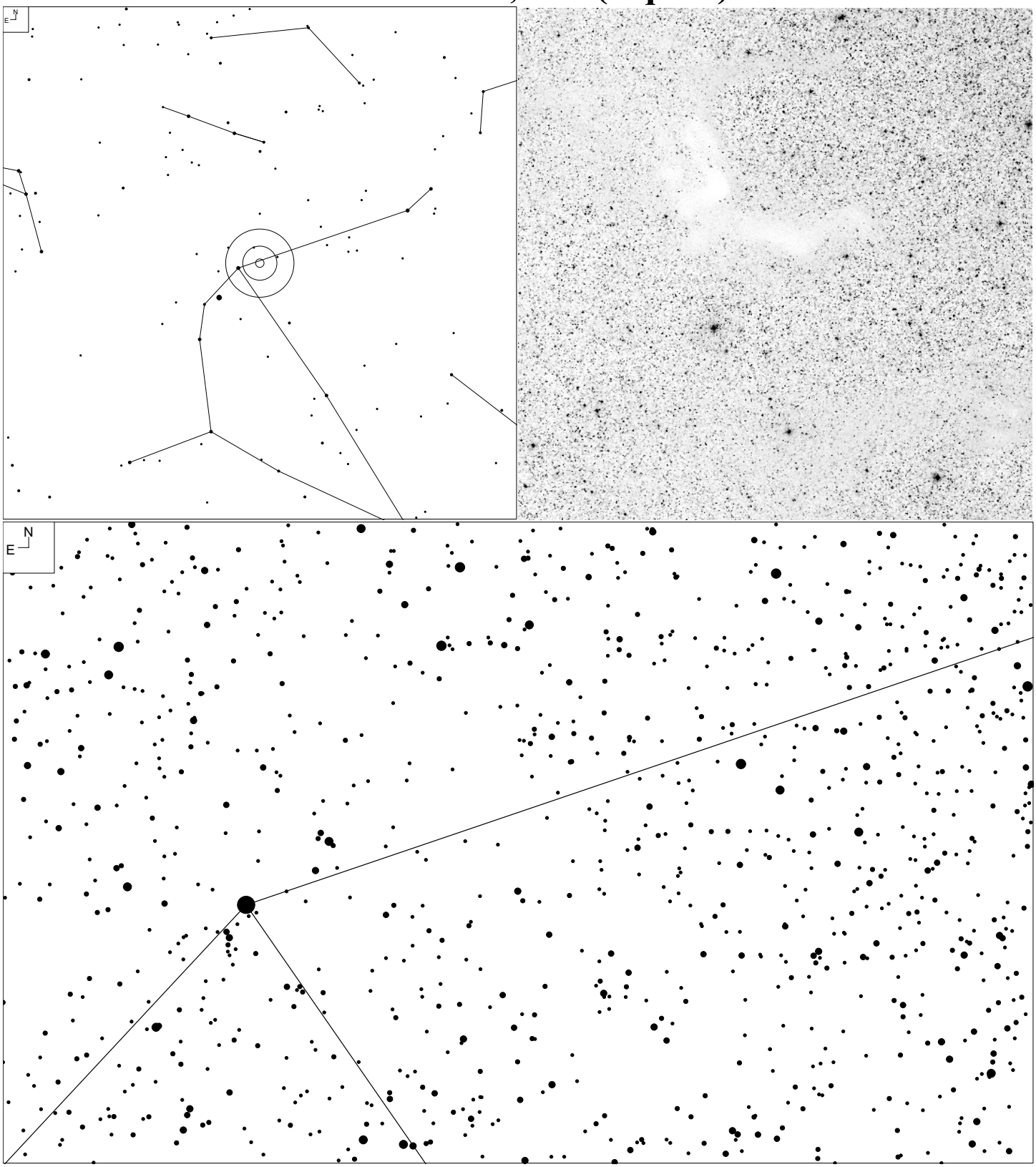
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Sanduleak 2-358	18 43 20.2	-09 04 49	13.3p	5.0”	PN	125	66

SS433 (Aquila)



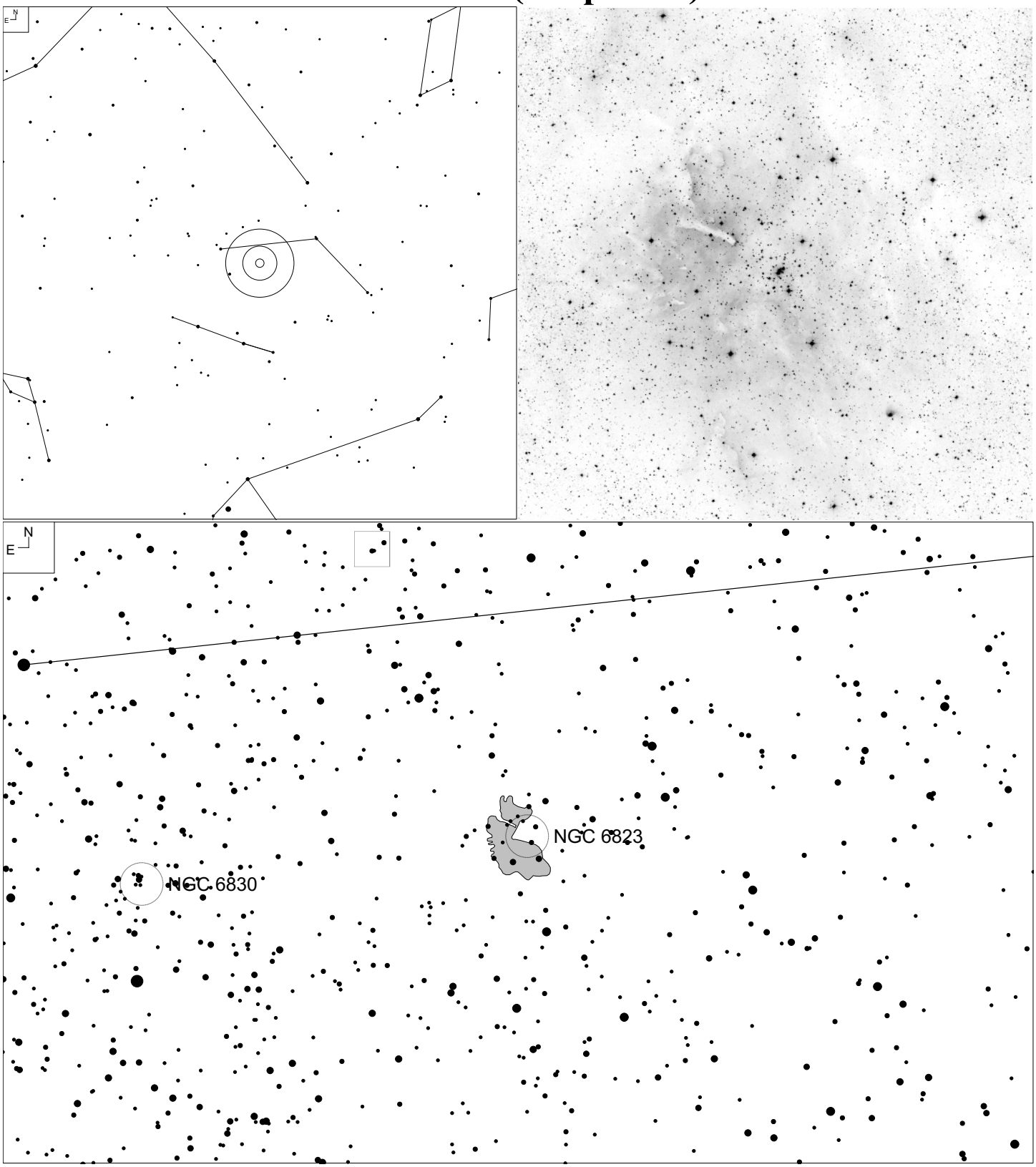
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
SN W50	19 11 49.6	+04 58 58	~15.0v	-	MQSO	105	54

Barnard 142, 143 (Aquila)



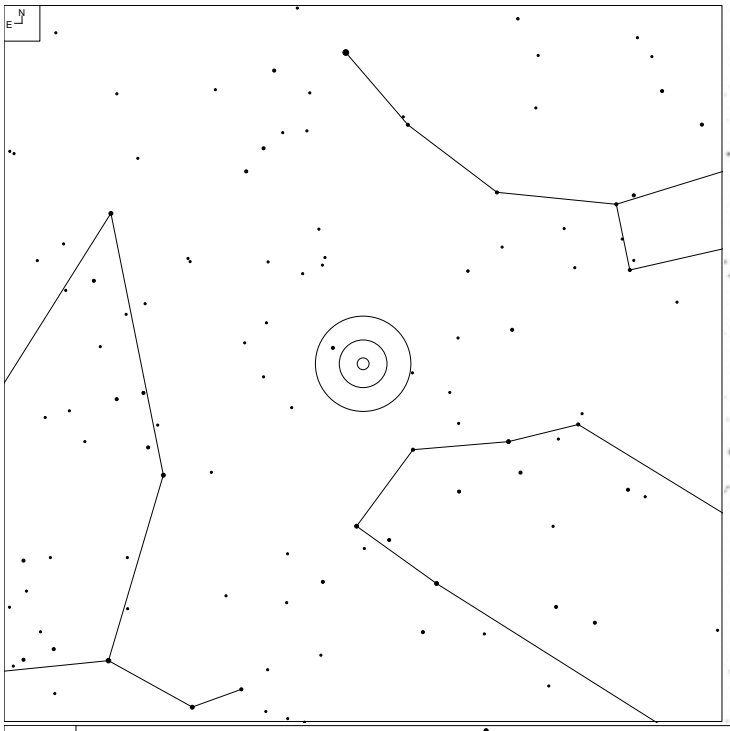
Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Barnards “E”	19 40 42.0	+10 57 00	--	52 x 38”	DNeb	85	42

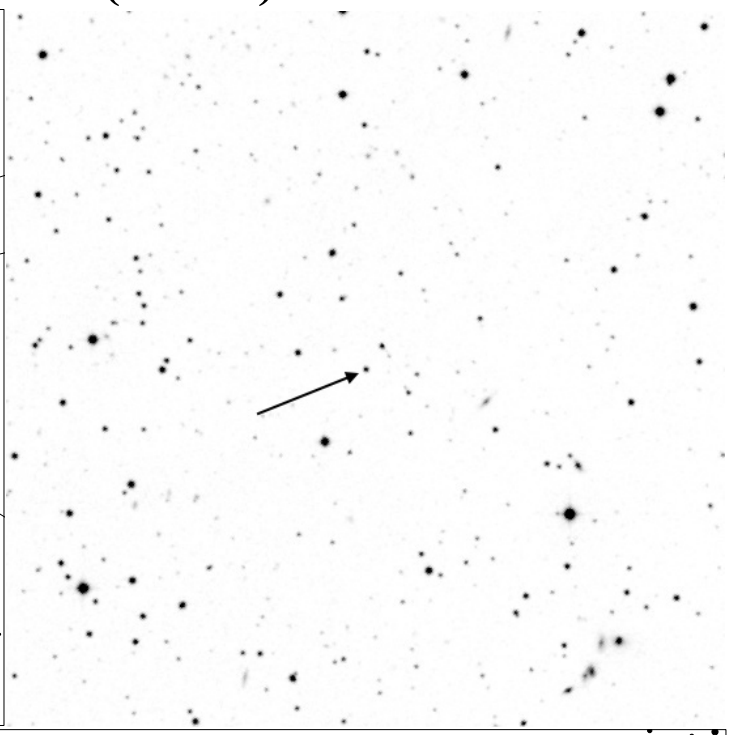
NGC 6820 (Vulpecula)

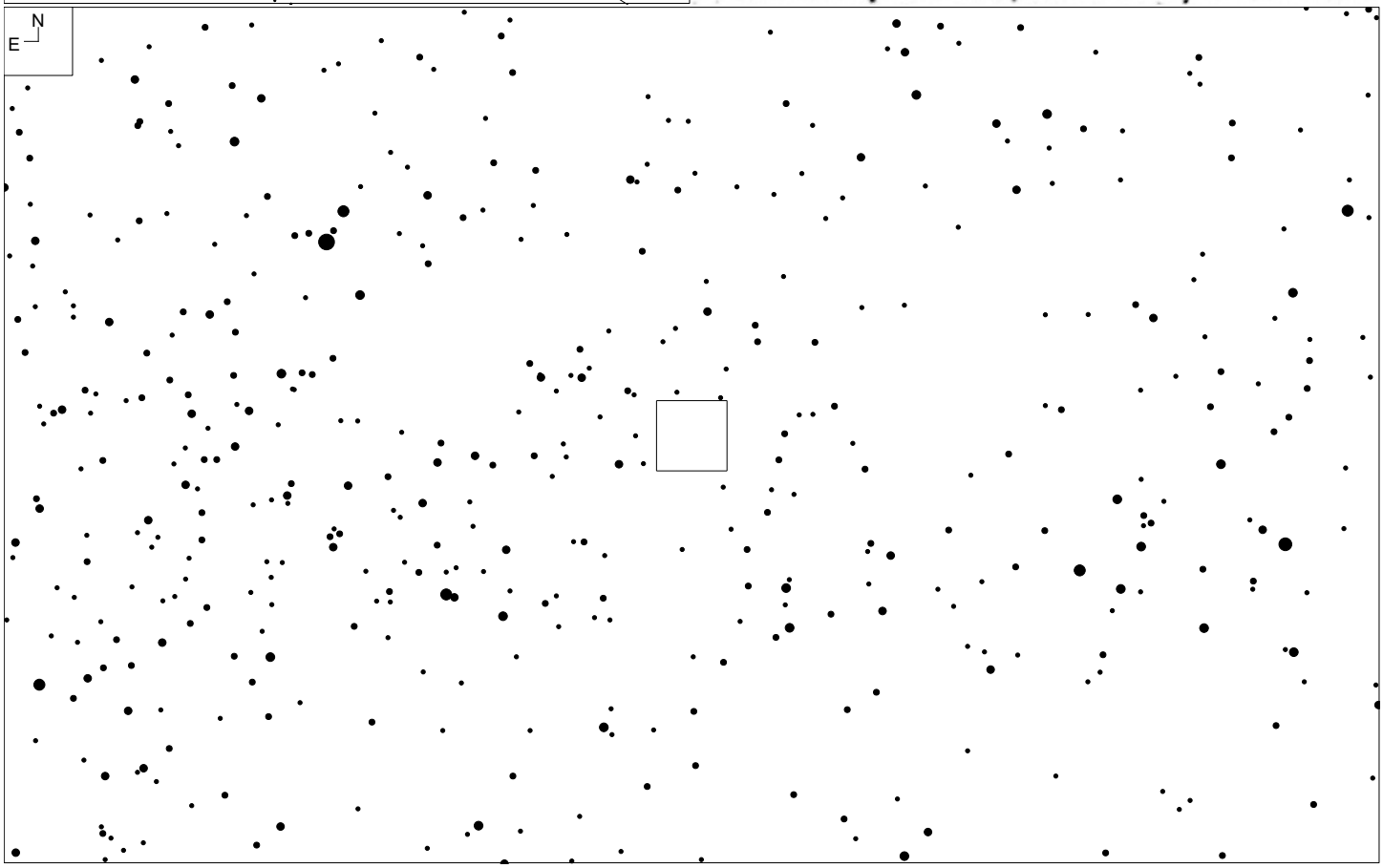


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Sh 2-86	19 43 23.0	+23 16 00	--	24.7’ x 12.0’	ENeb	66	30
NGC 6823	19 43 12.0	+23 18 00	--	12.0”	OC		

B1946+7658 A-B (Draco)

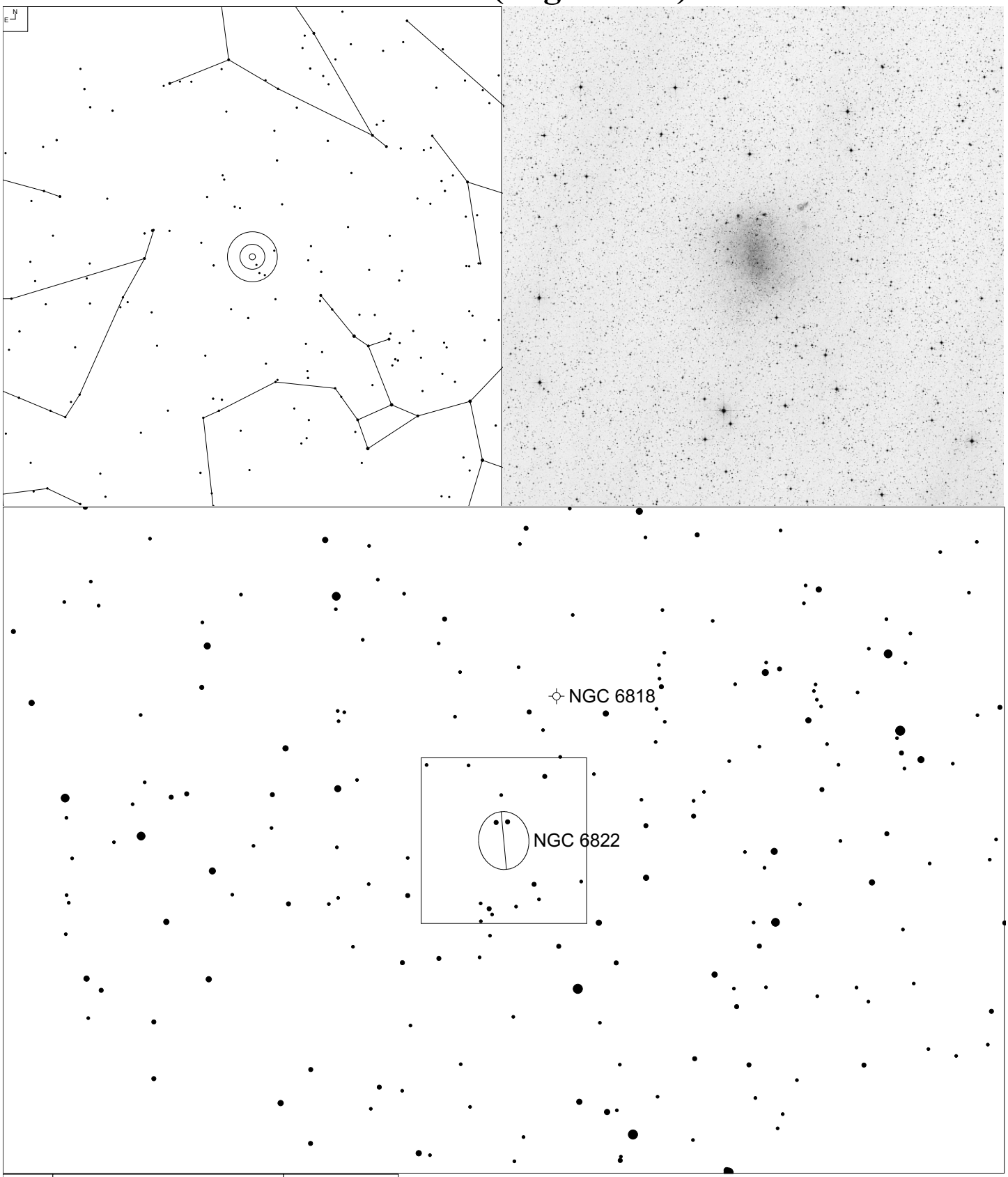




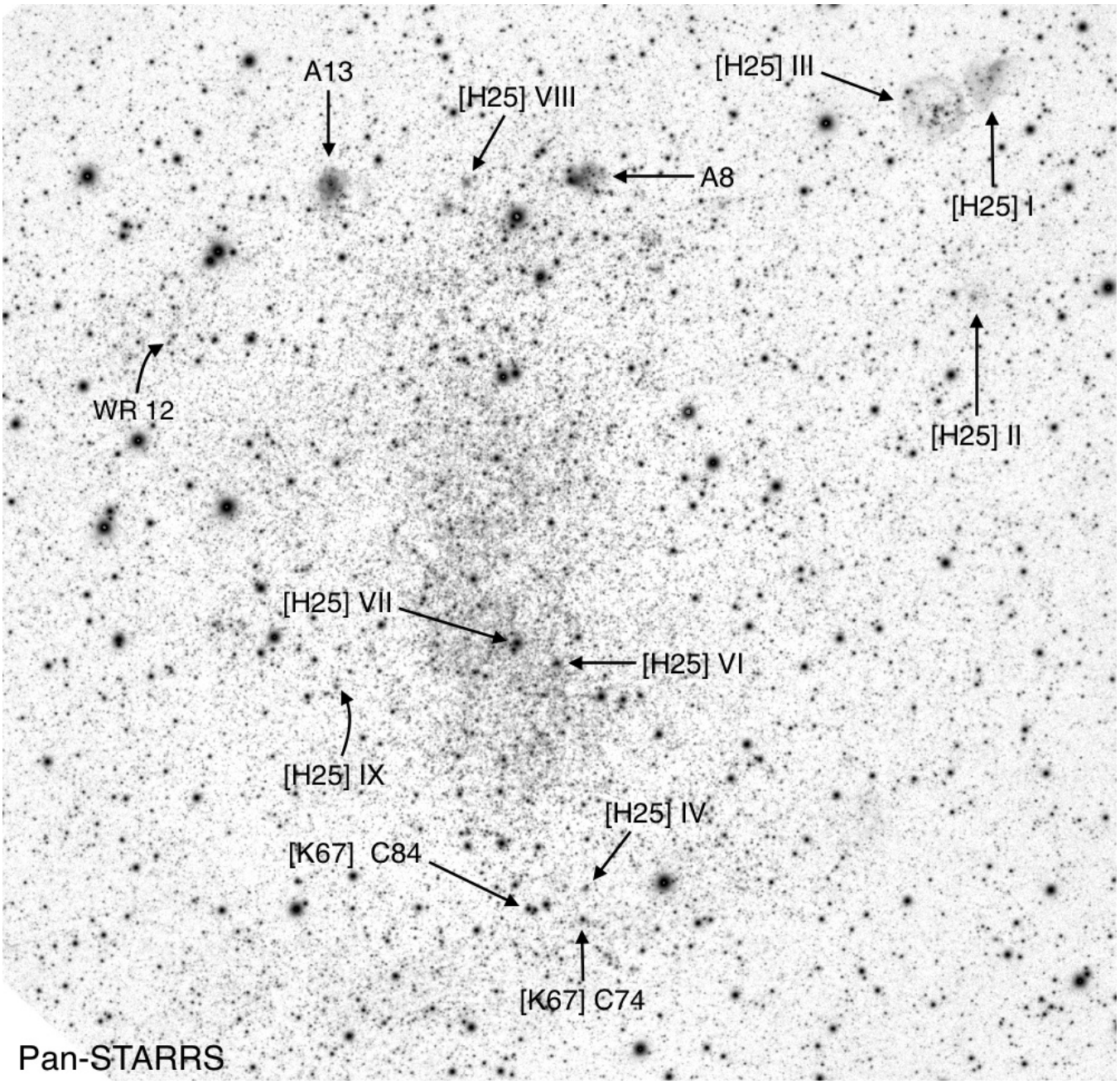


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
B1946+770	19 44 54.6	+77 05 53	15.9v	stellar	QSO	3	3

NGC 6822 (Sagittarius)



Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
Barnard's Gal.						125	66



Object	Type	RA	Dec	Mag
[H25] I[1]	H II	19 44 31.4	-14 41 56	15.0b
[H25] II	H II	19 44 32.0	-14 44 38	-
[H25] III	H II	19 44 34.3	-14 42 19	14.2
[H25] IV	H II	19 44 52.2	-14 51 58	-
[K67] C74[2]	Star	19 44 52.3	-14 52 21	16.5v
A8 = [H25] V	OB	19 44 52.4	-14 43 10	-
[H25] VI	GC	19 44 53.6	-14 49 11	16.3v

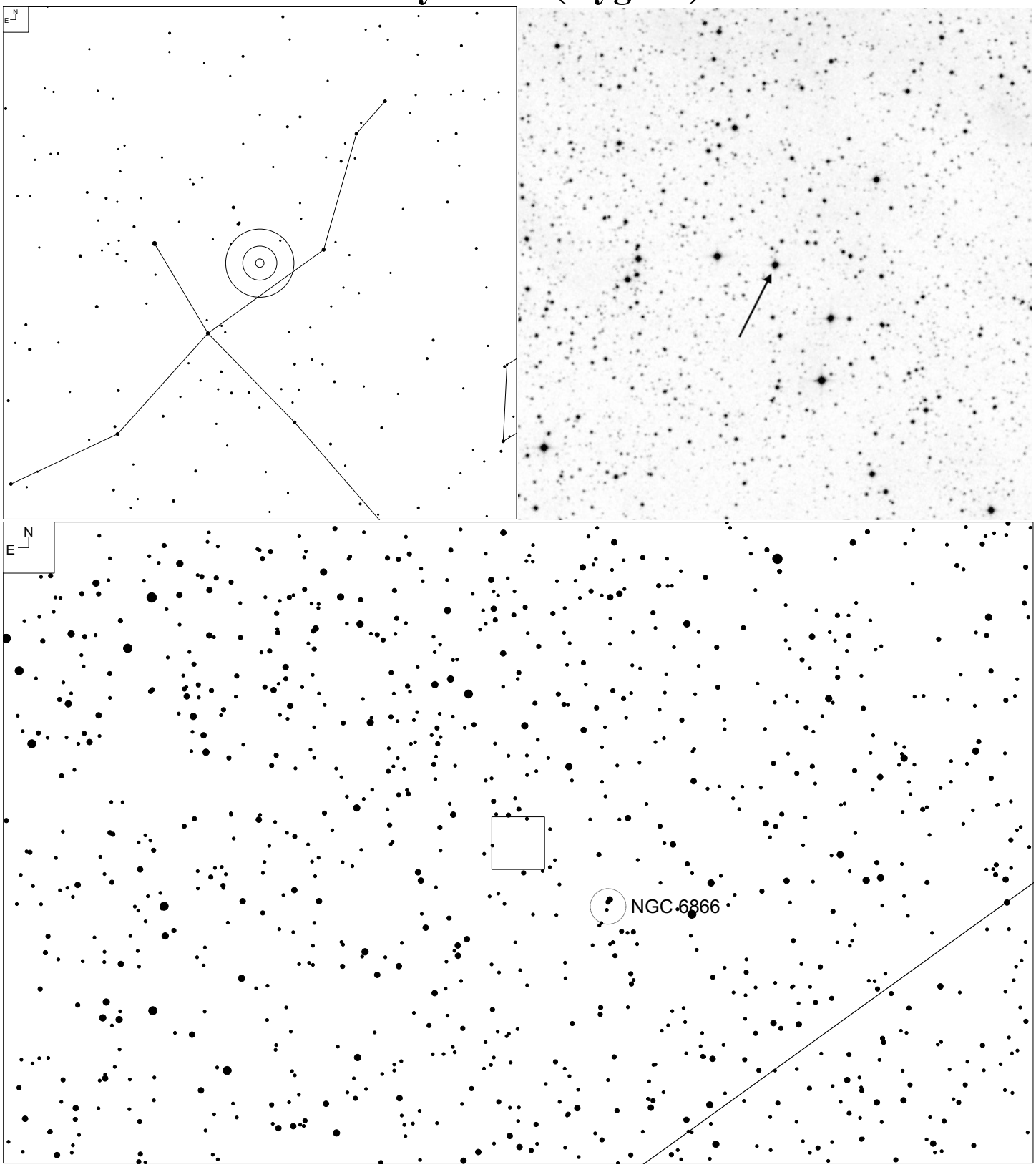
Object	Type	RA	Dec	Mag
[K67] C84	Star	19 44 55.1	-14 52 13	16.0v
[H25] VII	GC	19 44 55.8	-14 48 56	15.9v
[H25] VIII	GC	19 44 58.3	-14 43 14	17.9v
[H25] IX	GC	19 45 05.0	-14 49 29	18.6
A13 = [H25] X	OB	19 45 05.2	-14 43 15	-
WR 12[3]	WR	19 45 13.5	-14 45 13	19.0v

[1] For [H25] designation, see Edwin P. Hubble, "NGC 6822, A Remote Stellar System," Astrophysical Journal Vol 62 (1925): 409-433

[2] For [K67] designation of NGC 6822's stars, see S.E. Kayser, "Photometry of the Nearby Irregular Galaxy NGC 6822," *Astronomical Journal* Vol 72 (1967): 134-148

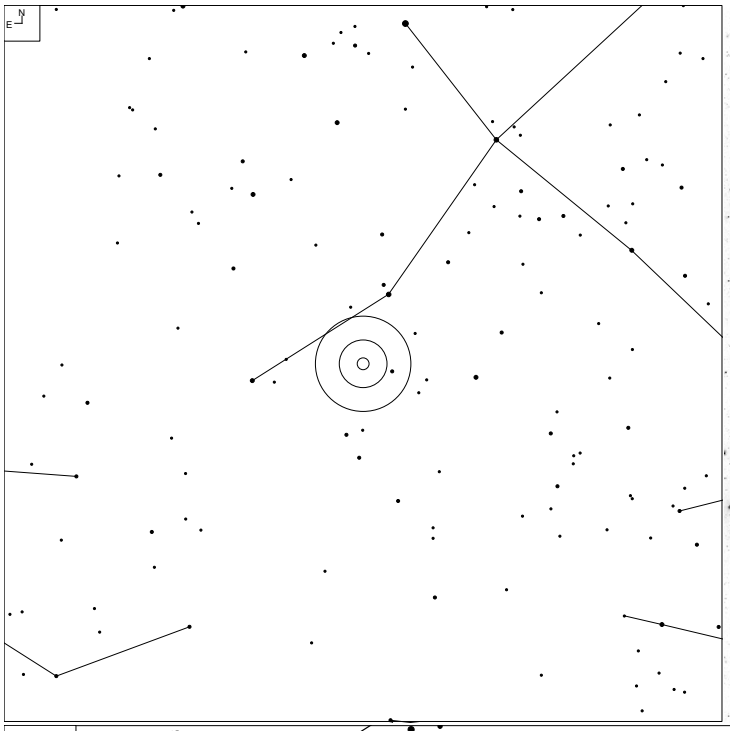
[3] WR 12 is the brightest Wolf-Rayet star of NGC 6822. The full name is [AM85] NGC 6822 12. See T.E. Armandroff and P. Massey, "Wolf-Rayet Stars in NG 6822 and IC 1613," *Astrophysical Journal* Vol 291 (1985): 685-692

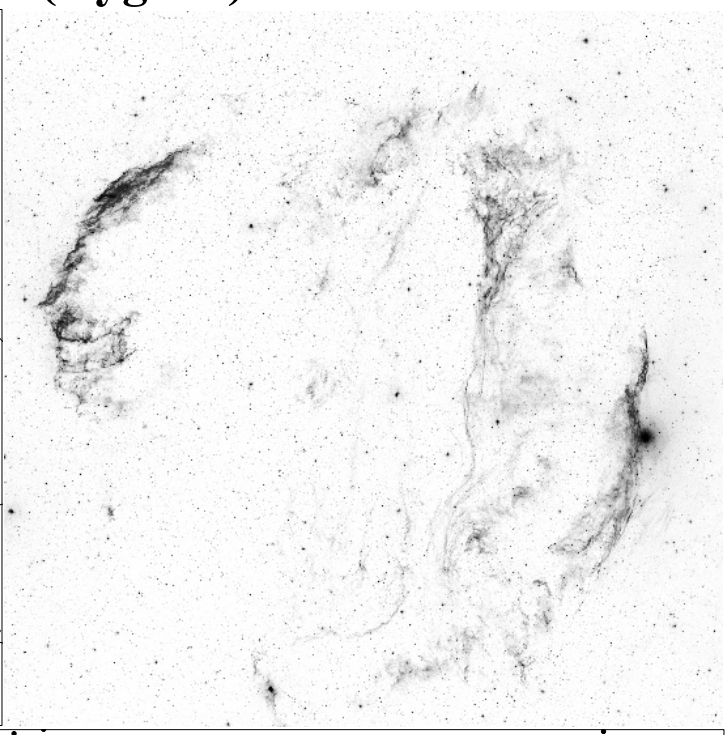
Tabby's Star (Cygnus)

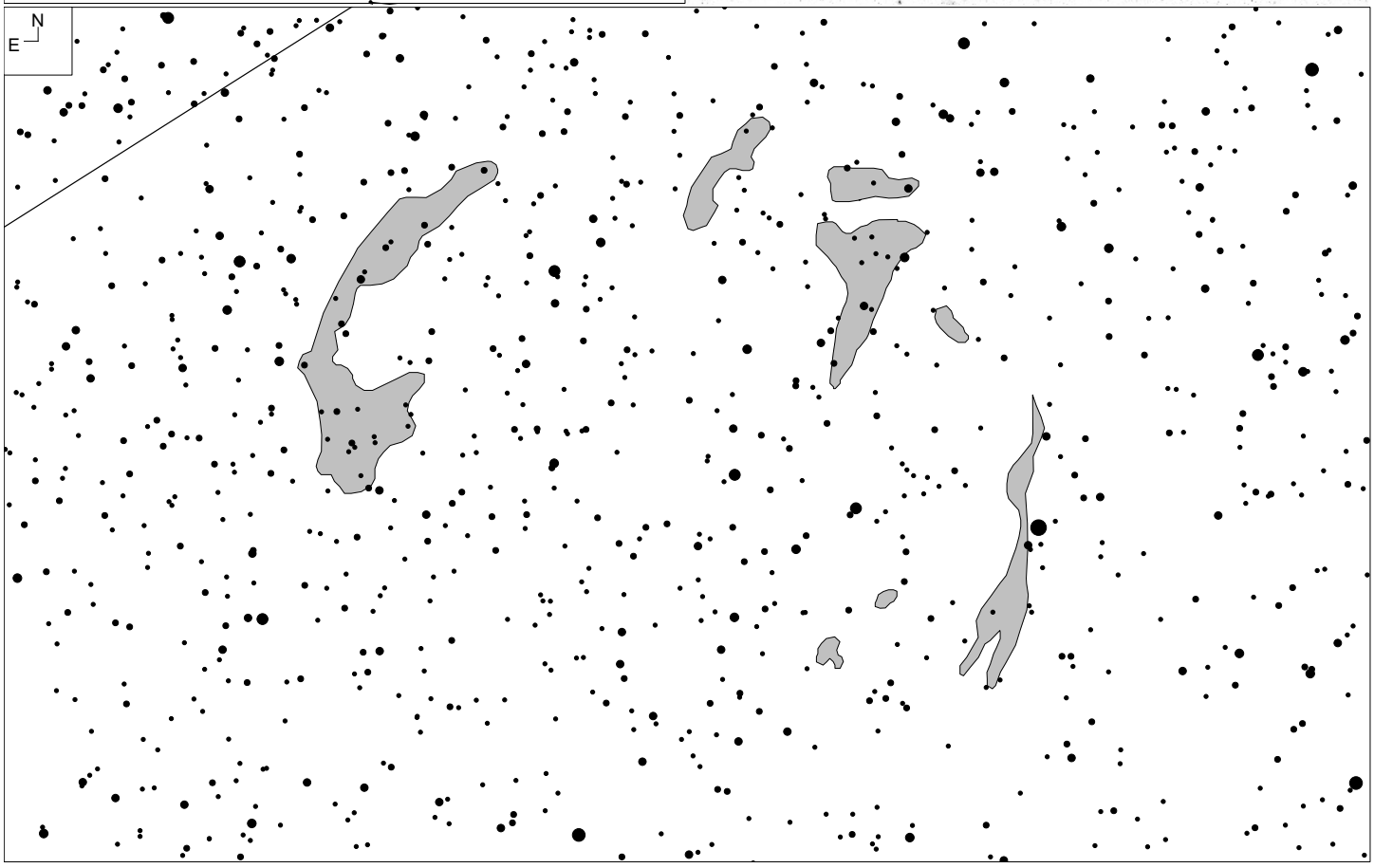


Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
KIC 8462852	20 06 15.5	+44 27 25	11.7v	stellar	star	32	17

Veil Nebula (Cygnus)







Other ID	RA	Dec	Mag	Size	Class	Urano 2	iDSA
North Veil	20 50 50.0	+31 58 00	--	28 x 7’	SN	47	29
East Veil	20 57 00.0	+31 30 00	--				

The Texas Star Party Advanced Observing Program – 2026

Sir William Herschel – The BEST Visual Observer – EVER !

This year the Advanced Program is celebrating the life of Sir William Herschel (1739 – 1822) who is recognized as the "Father of Modern-Day Astronomy", yet most amateur and professional astronomers fail to appreciate the tremendous impact Herschel's genius had on the imperfect science of astronomy at the time. He began as an amateur who initially was ridiculed, but soon all the so-called professionals were eagerly awaiting his next discovery, which eventually became the astronomical standard for the next one hundred years. Also, his sister Caroline and his son John were equally impressive and admired in their own time. Just a few of Herschel's accomplishments include him building the largest and finest telescopes ever made, his discovery of moons of Saturn and Uranus, his discovery of 850 double stars and 2,508 deep sky objects, and his astronomical spectrophotometry which led to his discovery of infrared radiation. There are many more accomplishment which are too many to include here – Please attend my Monday night presentation.

I personally became enamored with Herschel when I set out to observe all 2,508 of his deep sky discoveries, which I accomplished using my 10-inch and 24-inch telescopes. Some of these objects were so faint that I had to come back another night for a successful observation, and I knew exactly where to look. However, Herschel immediately saw these objects with his inferior speculum metal mirror in humid, coal fired, near sea level English skies. For me what began as an interesting project, led to admiration and finally just plain astonishment at his visual abilities. Then I learned about his scientific accomplishments, which led to further astonishment.

This years Advanced Program is a listing of a few of Herschel's visual discoveries, and some are easy and some are not so easy. The goal is to educate observers as to his incredible visual acuity, so please try some of the fainter 15th magnitude objects, which he saw with the equivalent of a 13-inch glass mirror in a modern-day telescope. This year there are two ways to receive a TSP 2026 Advanced pin. First is the standard way of successfully observing 20 objects on the observing list. Secondly, is a program called the "Herschel Hustle" or the "Herschel Sprint". Herschel discovered 70 new "nebulae" in only one night (April 11 – 12, 1785), so the challenge is for participants try and equal the master's accomplishment in one night without resorting to a computer. Because the objects are not favorably placed in the TSP night sky in May, I will accept, in good faith, successful observations made in April before TSP begins.

As astronomers we are incredibly fortunate. We live in a fascinating, observable universe and every time a large telescope is aimed at an object, we learn something new, which is unprecedented among the sciences. Willam Herschel, Edwin Hubble, Alan Sandage, and many others would love to exchange places with amateurs like us simply because we are on the cutting edge of the science. As observers, we are privileged to view massive far-away objects that most people do not know even exists. This year's Advanced Program incorporates various types of NGC items all discovered by William Herschel, which are visible in telescopes of moderate to large apertures.

This should be an Easy Advanced Observing Pin for people to obtain.

The Advanced Observing Program was initiated to educate and challenge observers to locate and observe unfamiliar, extraordinary objects. Every object in the universe is unique and has a very interesting story to tell. There is no better place to push the visual limit than under the dark transparent West Texas sky. The TSP listed targets are best located and observed by careful and precise star-hopping. This teaches you about the night sky, so you know exactly where you are looking, rather than merely 'just up'. It is very helpful if the target is truly light challenging and it is most imperative that the observer know *EXACTLY* where in the field of view (FOV) to look, which is best accomplished by star-hoping to the object. Now that you know exactly where to look in the FOV, the observation becomes a simple "Do I see it" or "Do I not see it." Additionally, maybe the next time you can locate the object without a chart, from memory - Always the Best Way.

"Star Hop and be Educated." ----------A few Visual Observing Hints:

1.) Use various magnifications and plenty of both averted and direct vision viewing
2.) Embrace a large dose of Patience – Patience - Patience. Let the sky come to you, and it usually does.
3.) If the object is truly light challenging and you think you see it 3-times, you probably did. Log it and go to the next object.
4.) Use a black cloth head covering so that the only light that reaches the face comes from the eyepiece field of view.
5.) It helps to slightly jiggle the telescope as often a moving object jumps out.
6.) A photograph of the object is helpful and indicates internal or external objects that may be visually missed otherwise.
7.) In planning, pay attention to magnitudes and the distances, which give an indication of surface brightness.
8.) Knowing something about the object being viewed makes it an interesting object, and not just some faint fuzzy thing.
9.) Adopt the theory, that within reason anything may be seen - Until you have visually proven otherwise – on multiple nights.

To receive a TSP Advanced Observing Pin - From the One and Only – the TEXAS STAR PARTY:

1.) An Advanced Observing Pin will be awarded for observing any 20 of the listed objects – Depending on sky conditions.
2.) All observations must be made at the Texas Star Party, except for the "Herschel Hussle" program.
3.) Location by Star-Hopping is preferred, but computer "Go-To" systems are accepted.
4.) Observation programs from previous years may be completed for appropriate pins – I have plenty.
7.) T-Shirts are available for those completing ALL the Advanced Programs, including the TSP2024 Latham Springs event.
8.) Observations may be turned in to Larry Mitchell or Steve and Amelia Goldberg anytime during the Star Party.

◄ EXPAND YOUR PERCEIVED OBSERVING LIMITS - THIS IS WHAT THE ADVANCED PROGRAM IS ALL ABOUT ►

I hope you enjoy this challenge as much as I have in presenting it and that it gives you a new sense of Enjoyment and Confidence in your Abilities to Successfully View – With Your Own Eyes - Natures Grandest Arena - Our Wonderful - Magnificent Visual Universe.

Larry Mitchell
TSP Advanced Observing Program - 2026

The Texas Star Party Advanced Observing Program – 2026

Sir William Herschel – The BEST Visual Observer – EVER !

Visual Observers who observe 20 objects will be Awarded a TSP2026 Advanced Pin

NGC	Herschel	J2000	Type	Const	Mag.	Size	Class.	Dist.	Urano 1
NGC4025	III-617	11 59 09.9 +37 48 34	Gal	UMa	14.9 (B)	2.7' x 1.5'	SB(s)cd	145 MLYrs	107
NGC4037	III-77	12 01 23.7 +13 24 06	Gal	Com	13.8 (B)	2.5' x 2.0'	SB(rs)b	38.0 MLYrs	193
NGC4074	III-393	12 04 29.7 +20 19 02	Gal	Com	14.4 (V)	0.9' x 0.5'	S0 (pec)	319.0 MLYrs	148
NGC4189	II-106	12 13 47.3 +13 25 31	Gal	Com	11.7 (V)	2.5' x 2.0'	SAB(rs)cd	117.0 MLYrs	193
NGC4213	II-354	12 15 37.6 +23 58 56	Gal	Com	14.3 (B)	1.7' x 1.3'	E	344.0 MLYrs	148
NGC4361	I-65	12 24 30.8 -18 47 02	P.N.	Crv	10.2 (V)	118" x 118"	IIIa+II	3.9 LYrs	328
NGC4395	V-29.1	12 25 49.9 +33 32 46	Gal	CVn	10.1 (V)	13.3' x 11.0'	SA(s)m	15.4 MLYrs	108
NGC4413	II-169	12 26 32.2 +12 36 38	Gal	Vir	12.25(V)	2.3' x 1.4'	(R)SB(rs)ab	51.3 MLYrs	193
NGC4430	II-146	12 27 26.3 +06 15 48	Gal	Vir	11.8 (V)	2.3' x 2.0'	SB(rs)b	62.0 MLYrs	193
NGC4436	II-172	12 27 41.2 +12 18 57	Gal	Vir	12.98 (V)	1.8' x 0.7'	S0	52.8 MLYrs	193
NGC4470	II-18/19	12 29 37.9 +07 49 25	Gal	Vir	12.9 (B)	1.4' x 0.9'	Sa?	108.9 MLYrs	193
NGC4550	I-36	12 35 30.3 +12 13 14	Gal	Vir	11.67 (V)	3.3' x 0.9'	SB0.sp	50.0 MLYrs	194
NGC5053	VI-7	13 16 27.0 +17 41 53	G.C.	Com	9.96 (V)	10.0' x 10.0'	--	56,700 LYrs	150
NGC5170	V-22	13 29 49.0 -17 57 59	Gal	Vir	10.79(V)	8.4' x 1.0'	SA(s)c: sp	83.5 MLYrs	330
NGC5466	VI-9	14 05 27.3 +28 32 04	G.C.	Boo	9.70 (V)	9.0' x 9.0'	XII	52,000 LYrs	110
NGC5698	II-700	14 37 14.7 +38 27 14	Gal	Boo	14.0 (B)	2.2' x 0.9'	SBp	181.0 MLYrs	111
NGC5836	III-312	14 59 31.1 +73 53 35	Gal	UMi	14.9 B)	1.1' x 0.9'	SC(rs)b	329.7 MLYrs	10
NGC5921	I-148	15 21 56.5 +05 04 13	Gal	Ser	12.7 (B)	4.9' x 3.9'	SC(r)bc	80.0 MLYrs	199
NGC5965	II-762	15 34 02.2 +56 41 08	Gal	Dra	13.4 (B)	5.2' x 0.7'	Sb	161.1MLYrs	51
NGC5990	II-425	15 46 16.3 +02 24 56	Gal	Ser	13.1 (B)	1.5' x 0.8'	(R)Sa pec?	190.5 MLYrs	245
NGC6267	III-123	16 58 08.6 +22 59 04	Gal	Her	14.0 (B)	1.3' x 1.0'	SB(r)bc	138.6 MLYrs	157
NGC6284	VI-11	17 04 28.8 -24 45 53	G.C.	Oph	7.43 (V)	6.2' x 6.2'	IX	46,300 LYrs	337
NGC6301	IV-57	17 08 32.9 +42 20 19	Gal	Her	14.6 (B)	2.3' x 1.4'	Scd	381.0 MLYrs	80
NGC6293	VI-12	17 10 10.4 -26 34 54	G.C.	Oph	8.3	8.2' x 8.2'	IV	31,000 LYrs	337
NGC6445	II-586	17 49 14.9 -20 00 36	P.N.	Sgr	13.2 (P)	44.0" x 50.0"	IIIb+III	4,500 LYrs	338
NGC6507	VIII-53	17 59 36.0 -17 23 00	O.C.	Sgr	9.5 (V)	6.0' x 6.0'	IV 3 m	3,900 LYrs	339
NGC6517	II-199	18 01 50.6 -08 57 32	G.C	Oph	11.8 (B)	4.0' x 4.0'	--	34,000 LYrs	294
NGC6553	IV-12	18 09 17.3 -25 54 28	G.C.	Sgr	9.08 (B)	8.3' x 8.3'	V	16,756 LYrs	339
NGC6568	VII-30	18 12 48.0 -21 35 00	O.C.	Sgr	8.6	12.0' x 12.0'	IV 1 m	3,520 LYrs	339
NGC6583	VII-31	18 15 50.2 -22 08 38	O.C.	Sgr	10.0 (V)	4.0' x 4.0'	I 2 m	6,850 LYrs	339
NGC6604	VIII-15	18 18 06.0 -12 13 00	O.C.	Ser	6.5	6.0' x 6.0'	I 3 m n	6,330 LYrs	294
NGC6638	I-51	18 30 56.2 -25 29 47	G.C.	Sgr	9.68 (V)	7.3' x 7.3'	VI	31,300 LYrs	340
NGC6756	VII-62	19 08 43.3 +04 42 19	O.C.	Aql	10.6 (V)	4.0' x 4.0'	I 1 m	6,357 LYrs	251
NGC6772	IV-14	19 14 36.4 -02 42 27	P.N.	Aql	14.2 (P)	84.0" x 84.0"	IIIb+II	2,9800 LYrs	251
NGC6894	IV-13	20 16 24.0 +30 33 51	P.N.	Cyg	14.4 (P)	60.0" x 60.0"	IV + II	4,990 LYrs	119
NGC6905	IV-16	20 22 23.0 +20 06 16	P.N.	Del	14.5 (V)	72.0" x 37.0"	III + III	7,500 LYrs	163
NGC7067	VII-50	21 24 12.0 +48 01 00	O.C.	Cyg	9.70 (V)	3.0' x 3.0'	II 1 p	14,350 LYrs	86
NGC7128	VII-40	21 44 00.0 +53 43 09	O.C.	Cyg	9.70 (V)	3.1' x 3.1'	I 3 m	13,000 LYrs	57
NGC7160	VIII-67	21 53 48.0 +62 36 00	O.C.	Cep	6.10 (V)	7.0' x 7.0'	I 3 p	2,572 LYrs	33
NGC7635	IV-52	23 20 40.0 +61 12 00	Neb	Cas	--	16.0' x 3.0'	E	11,100 LYrs	34

NOTE: All are NGC objects discovered by William Herschel. Visually some are easy and some not so easy. Herschel visually discovered more celestial objects than anyone in history, and hopefully this program will enlighten some to his amazing visual acuity, stamina and genius…….L.M.

Quoted Distances: Based upon: 70km s^{-1} Mpc^{-1}

Mpc = 3.26 million light-years
MLYr = million light-years

Type

G.C. = Globular Cluster
Gal = Galaxy
Neb = Nebula
O.C. = Open Cluster
P.N. – Planetary Nebula

Galaxy Classification:

S = Spiral galaxy
E= Elliptical galaxy
SB0= Lenticular galaxy – Barred
I= Irregular galaxy
S0 = Lenticular galaxy
SA= Spiral galaxy with NO bar
SB = Spiral Galaxy with bar
SAB=Intermediate galaxy - Weakley bared spirals
SA0= Lenticular galaxy – UnBarred
SB0= Lenticular galaxy – Barred
Sd (SBd)= Diffuse broken arms, faint central bulge
Sm (SBm)= Irregular appearance, No bulge
Im= Highly Irregular galaxy
r = Rings
s= Without rings
rs = Transition galaxy – Partial rings

Wm. Herschel Classification:

I Class: *Bright nebulae*
II Class: *Faint nebulae*
III Class: *Very faint*
IV Class: *Planetary nebulae*
V Class: *Very large nebulae*
VI Class: *Very compressed & rich clusters of stars*
VII Class: *Pretty much compressed clusters of large and small stars*
VIII Class: *Coarsely scattered clusters of stars*
NOTE: *Herschell called Galaxies –"Nebulae"*

Shapley-Sawyer G.C. Conc.:

Class. I: High concentration toward center
Class. I: Dense central concentration
Class. III: Strong inner core of stars
Class. IV: Intermediate rich concentrations
Class. V: Intermediate concentrations
Class. VI: Intermediate mild concentration
Class. VII: Intermediate Loose concentration
Class. VII: Rather loosely concentration to center
Class. IX: Loose toward the center
Class. XI: Very loose toward the center
XII: Almost no concentration to center

Trumpler Open Cluster Classification:

Class I= Detached – strong central condensation
Class II = Detached-Little central condensation
Class III- Detached-No noticeable condensation
Class IV- Appears as a starfield
1= Small brightness range, most stars look the same
2= Medium range in brightness- Equal bright & faint
3= Large range in brightness (Large gap with few bright)
p= Poor-clusters with < 50 stars
m= Medium – Clusters with 50-100 stars
r= Rich – Clusters with > 100 stars
n= Nebulosity (If present)

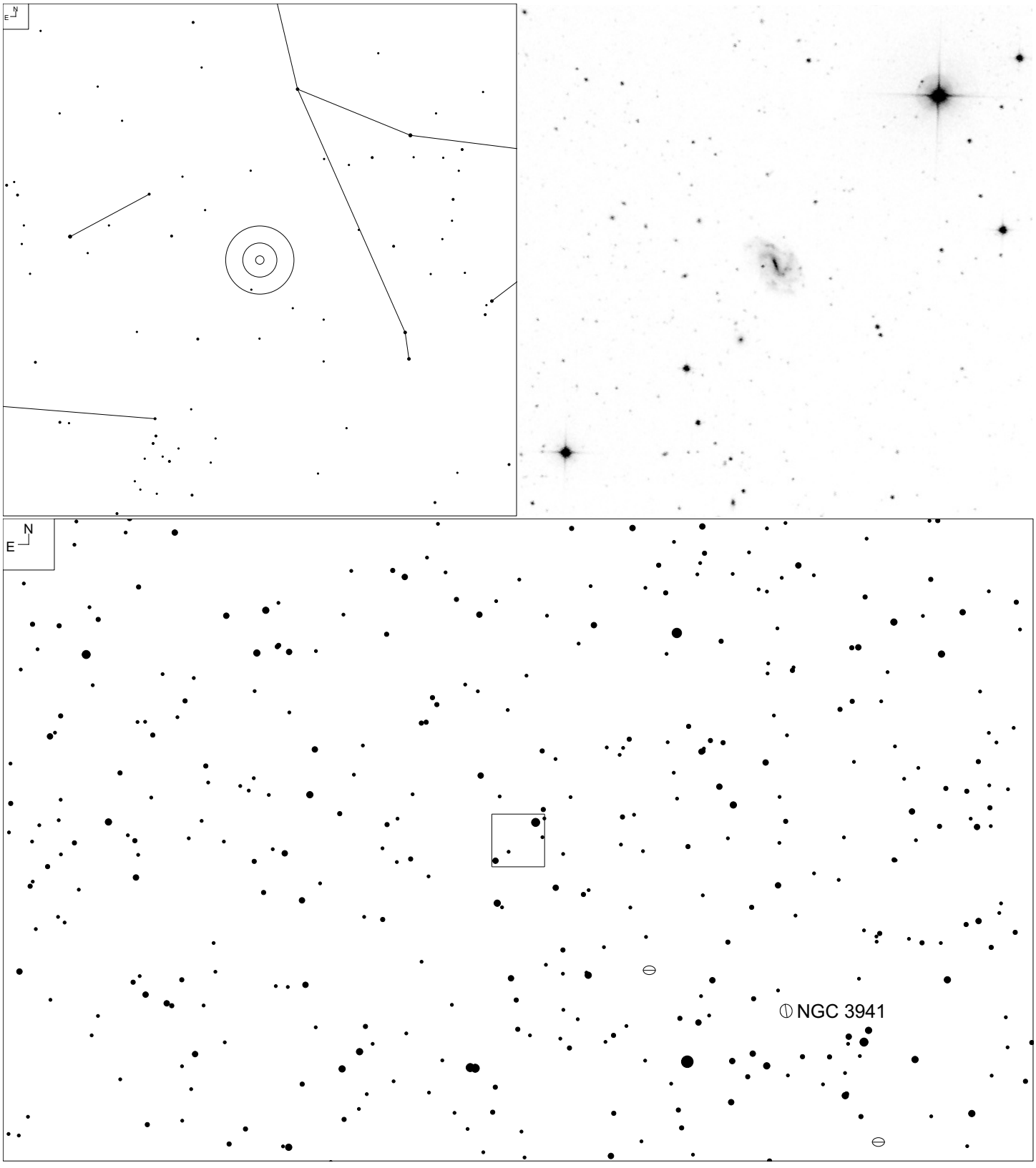
Planetary Nebula Classification:

I: Stellar image
II: Regular disk:
IIa: A shinier core
IIb: Uniform brightness
IIc: Presence of an annular structure
III: Irregular disk:
IIIa: Irregular brightness
IIIb: Presence of an annular structure
IV: Annular structure
V: Irregular form between a planetary & diffuse neb.
VI: Abnormal form without regular structure

TSP 2026
Good Luck – Ad astra:

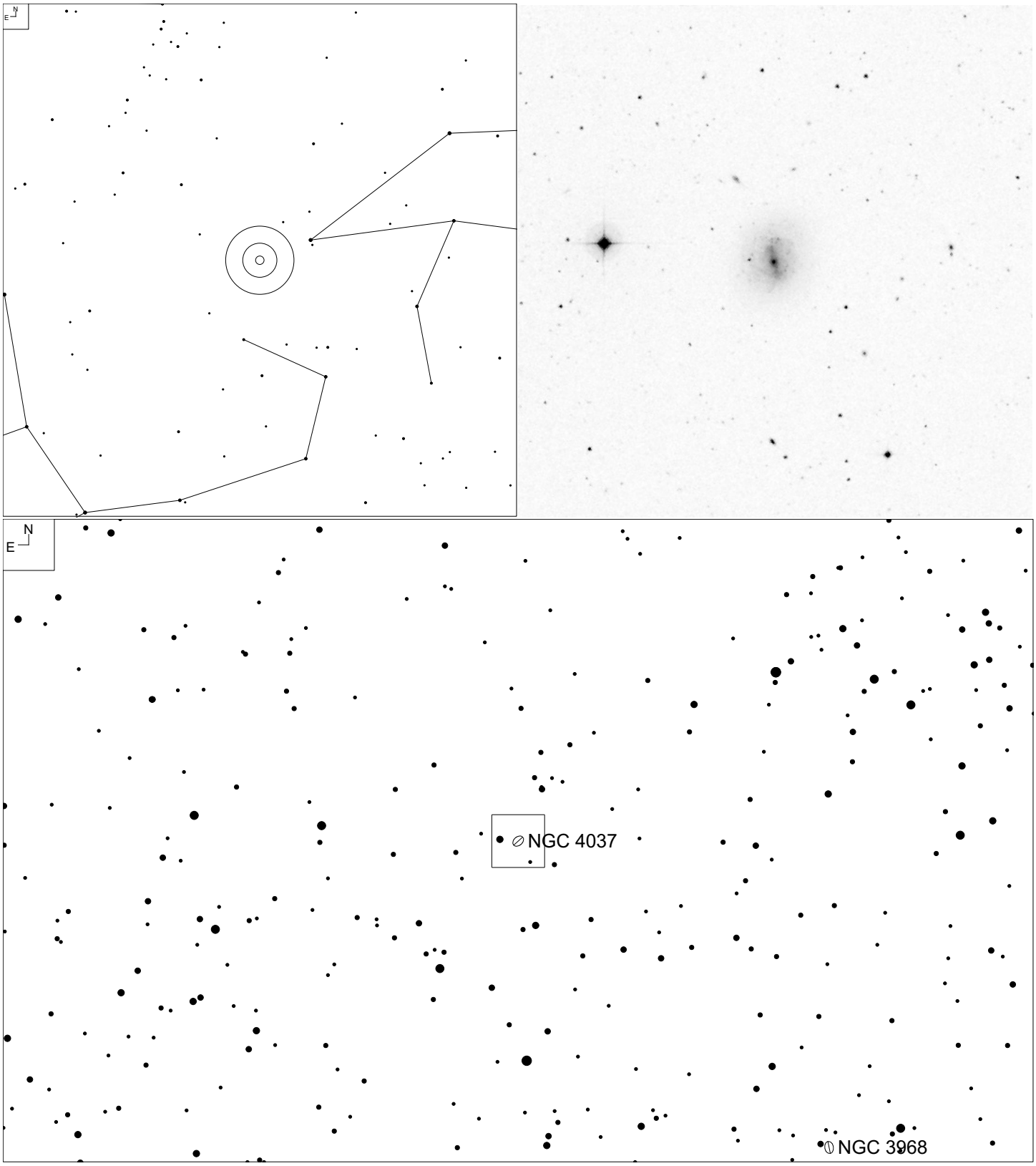
Larry Mitchell
larry.mitchell12@comcast.net
Houston Astronomical Society

NGC 4025 (Ursa Major)



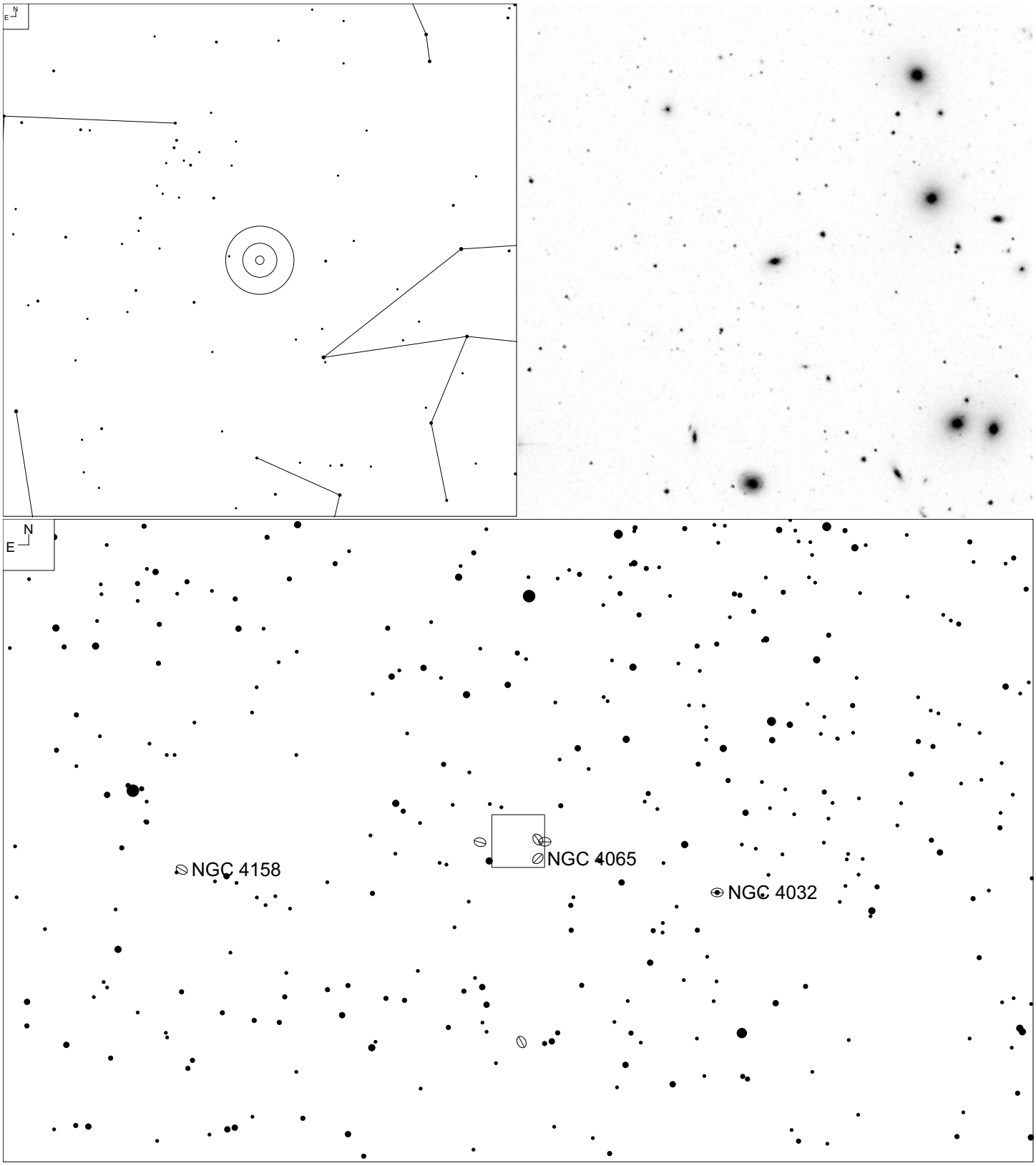
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
III-617	11 59 09.9	+37 48 34	14.9b	2.7’ x 1.5’	SB(s)cd	54	21

NGC 4037 (Coma Berenices)



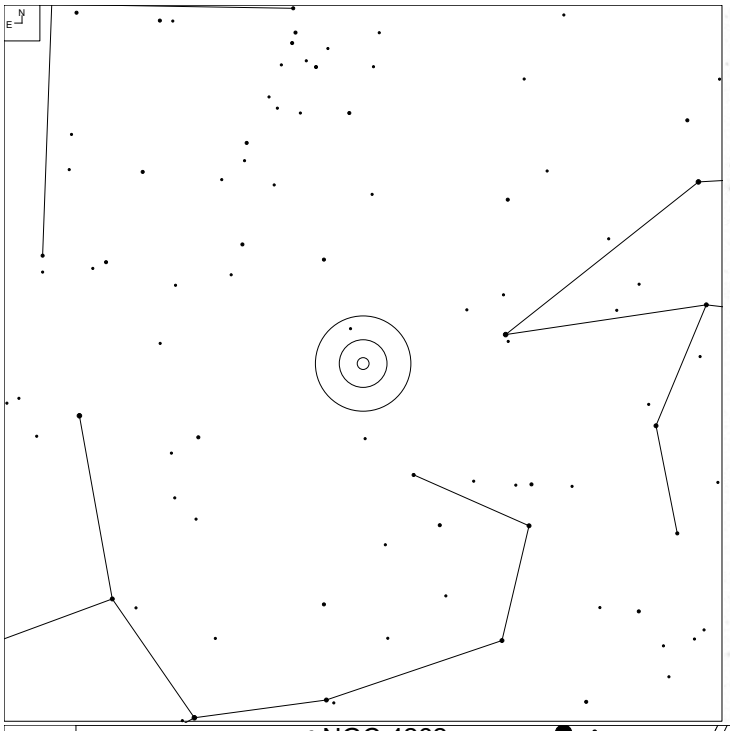
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
III-77	12 01 23.7	+13 24 06	13.8b	2.5 x 2.0’	SB(rs)b	91	45

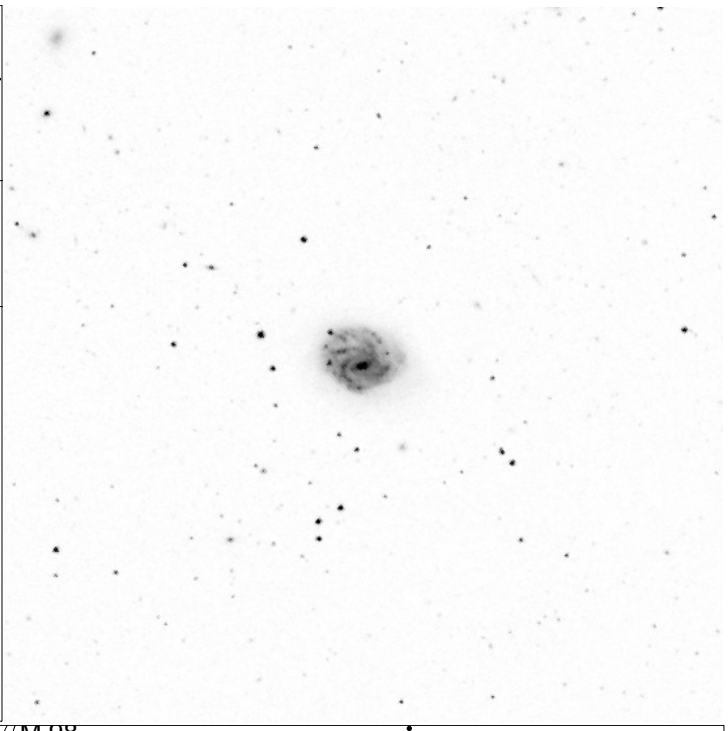
NGC 4074 (Coma Berenices)

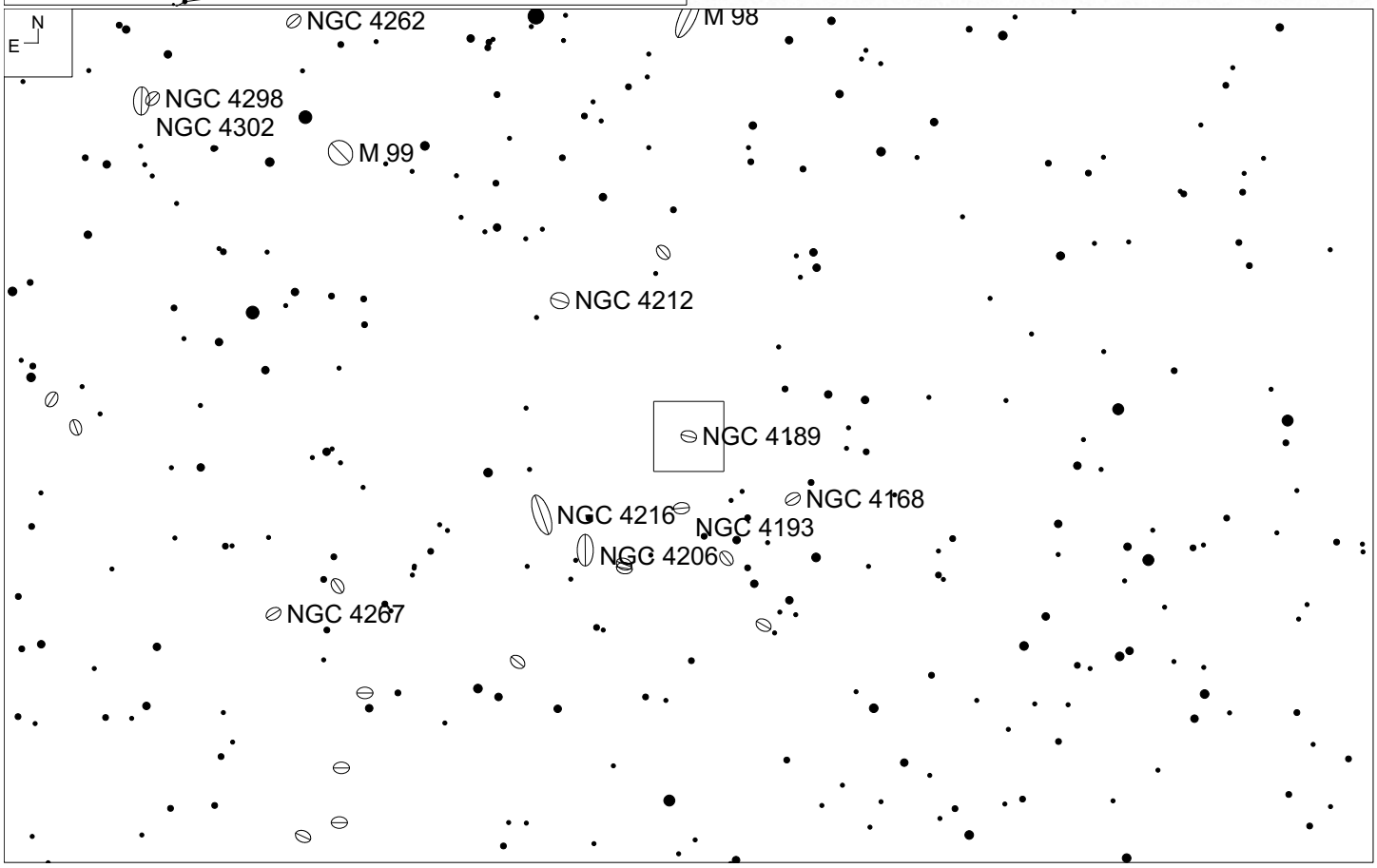


Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
III-393	12 04 29.7	+20 19 02	14.4v	0.9 x 0.5’	S0 (pec)	72	45

NGC 4189 (Coma Berenices)

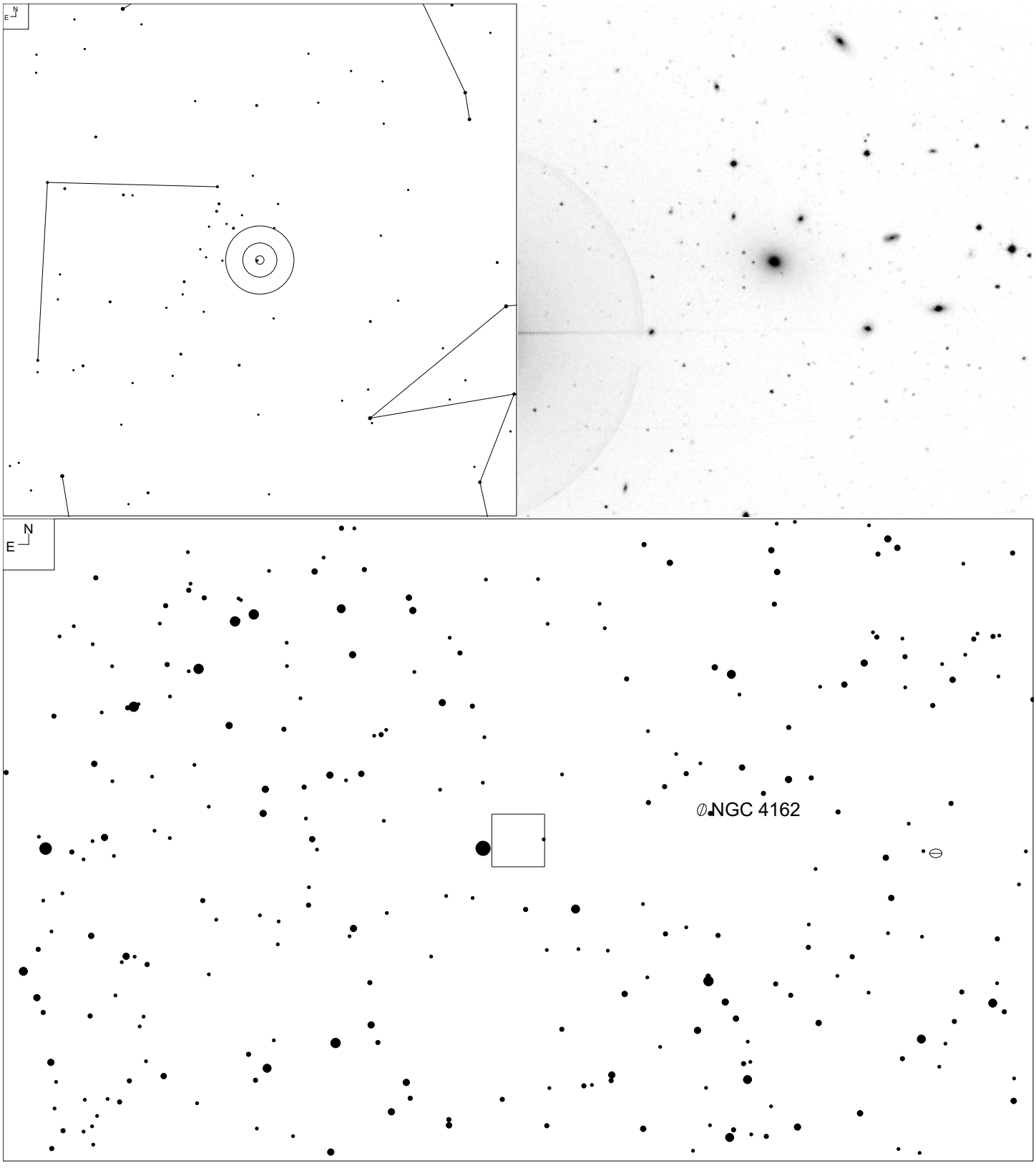






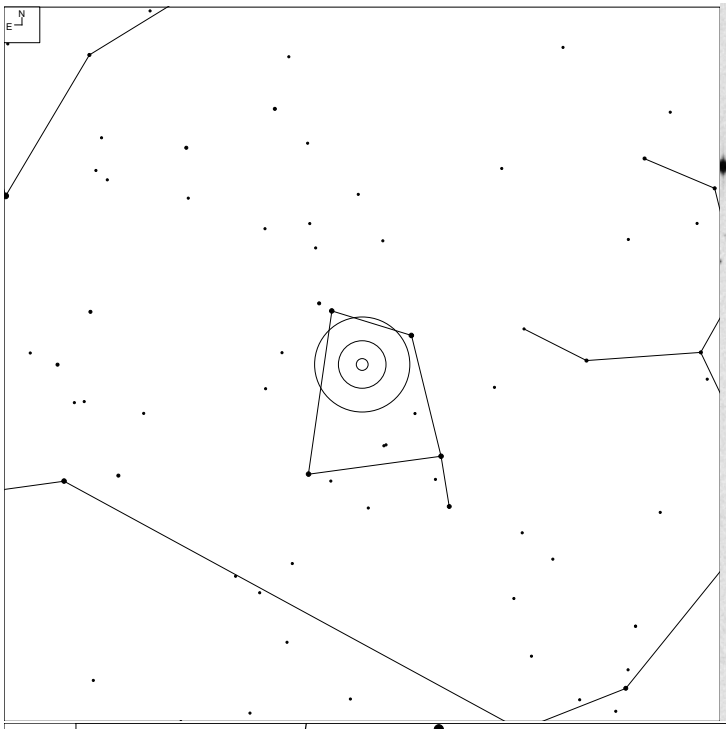
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
II-106	12 13 47.3	+13 25 31	11.7v	2.5 x 2.0’	SAB(rs)cd	91	45

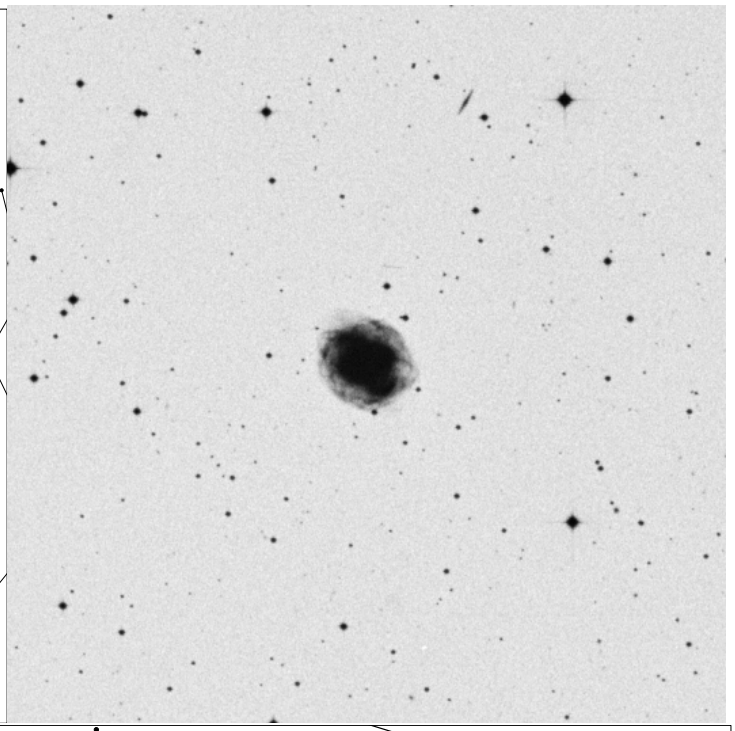
NGC 4213 (Coma Berenices)

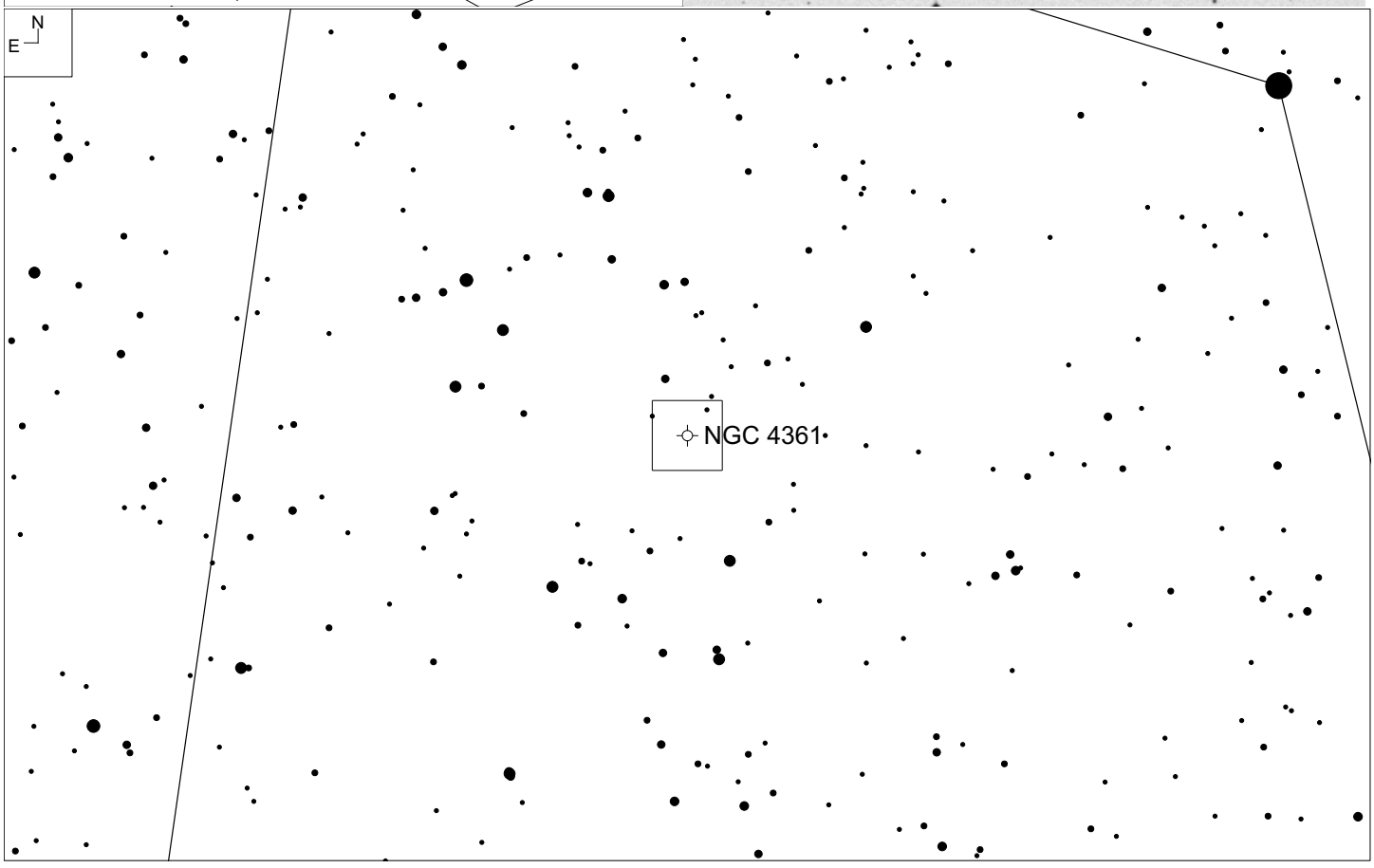


Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
II-354	12 15 37.6	+23 58 56	14.3b	1.7 x 1.3’	E	72	33

NGC 4361 (Corvus)

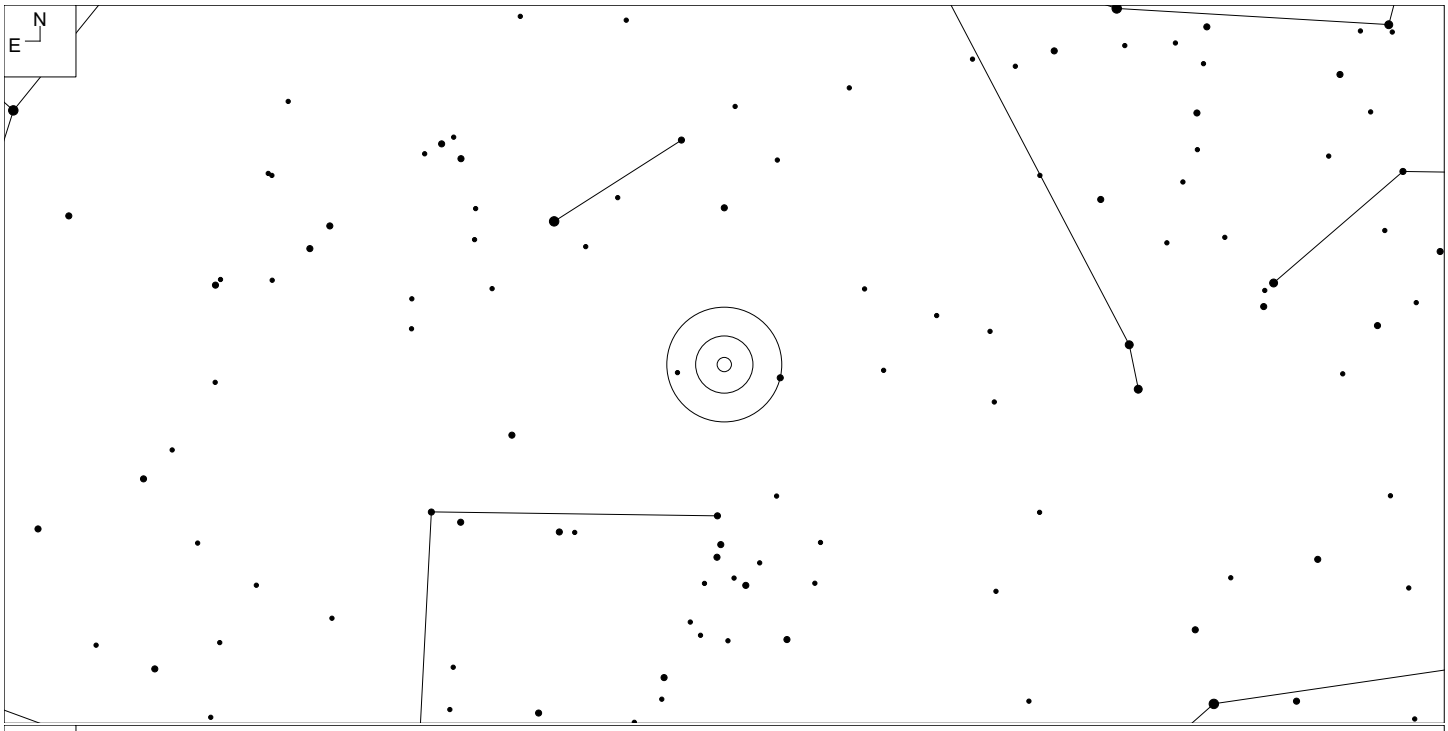


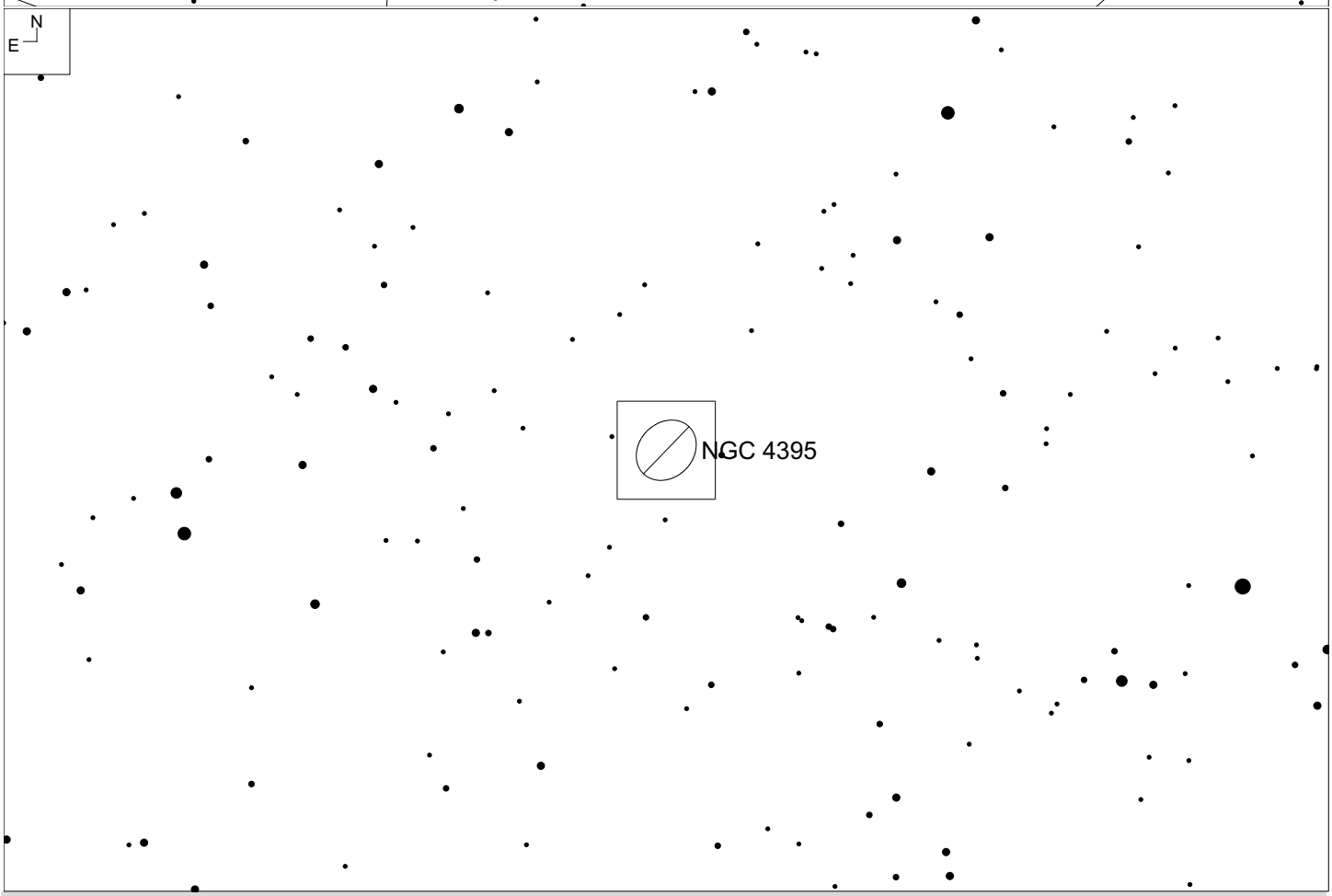




Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
I-65	12 24 30.8 -	-18 47 02	10.2v	118”	IIIa+II	150	69

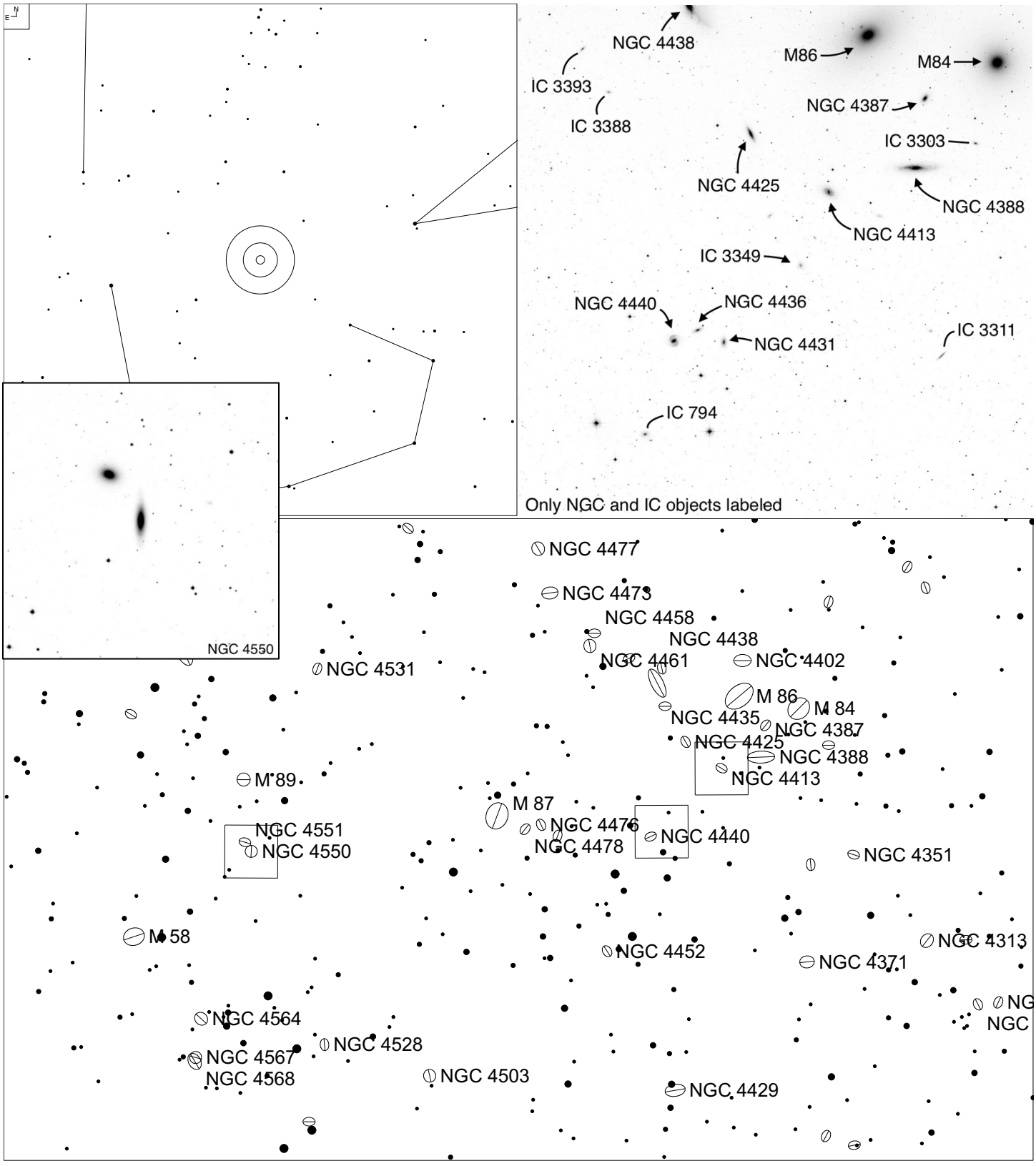
NGC 4395 (Canes Venatici)





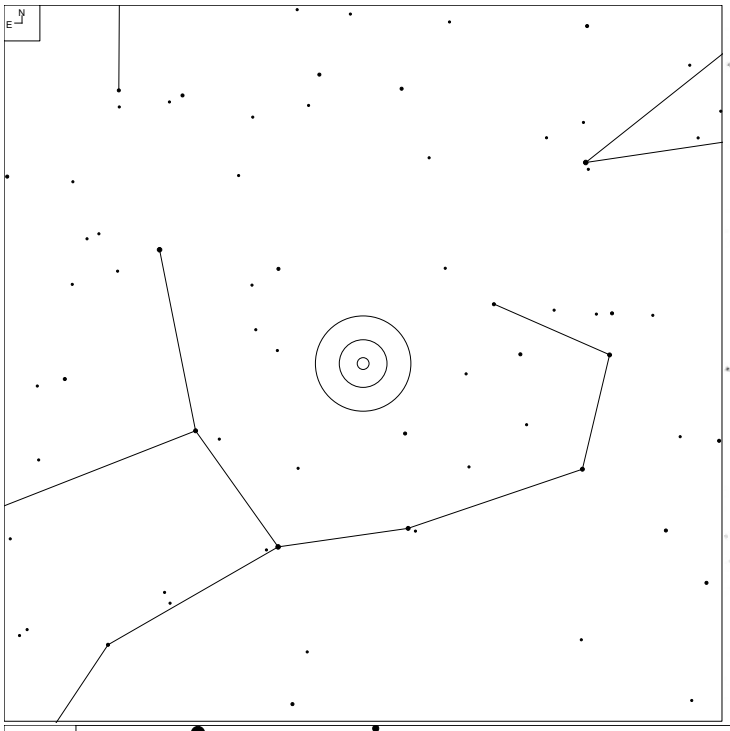
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
V-29	12 25 49.9	+33 32 46	10.1v	13.3 x 11.0’	SA(s)m	54	33

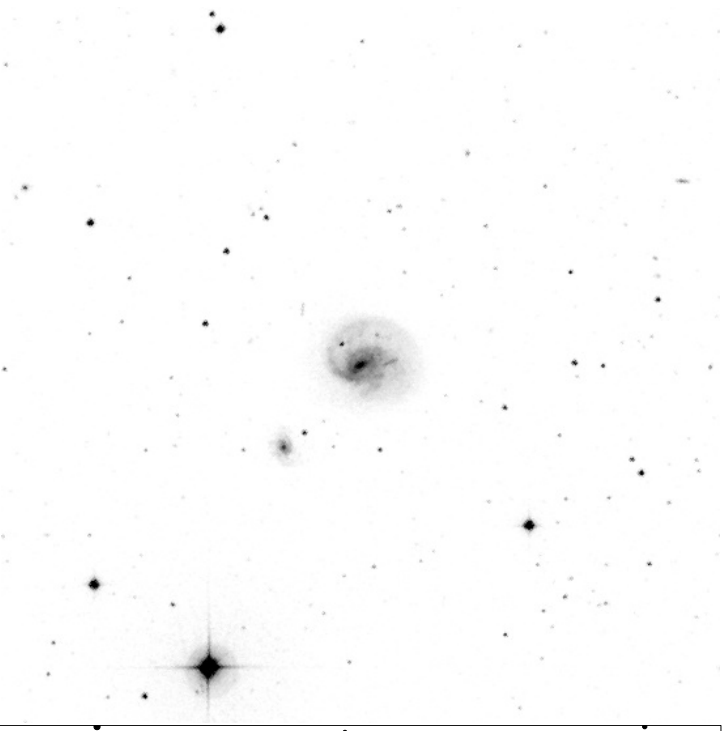
NGC 4413, 4436 and 4450 (Virgo)

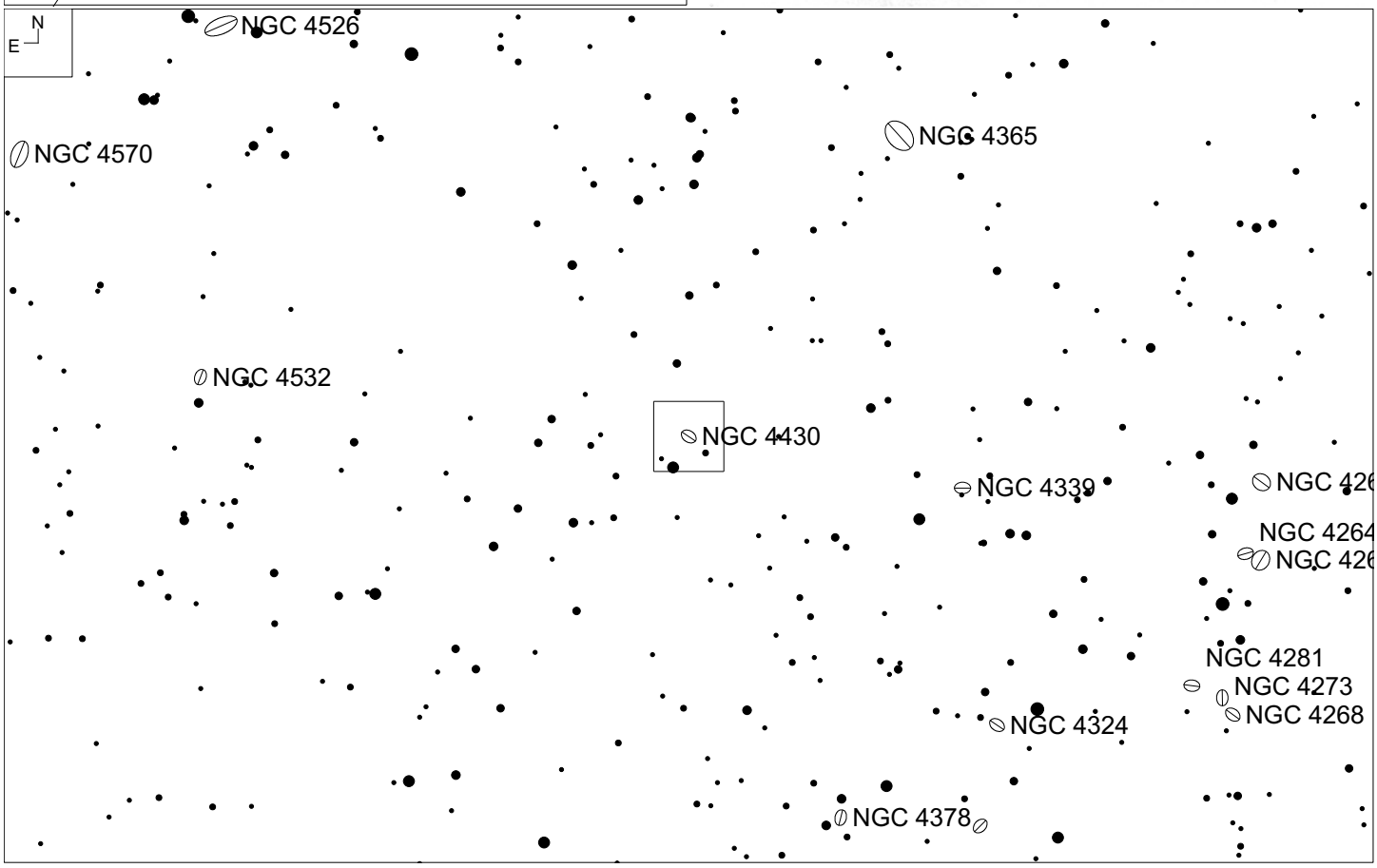


	Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
NGC 4413	**II-169**	12 26 32.2	+12 36 38	12.25v	2.3 x 1.4’	(R)SB(rs)ab	91	45, D2
NGC 4436	**II-172**	12 27 41.2	+12 18 57	13.0v	1.8 x 0.7’	S0		
NGC 4450	**I-36**	12 35 30.3	+12 13 14	11.7v	3.3 x 0.9’	SB0.sp		

NGC 4430 (Virgo)

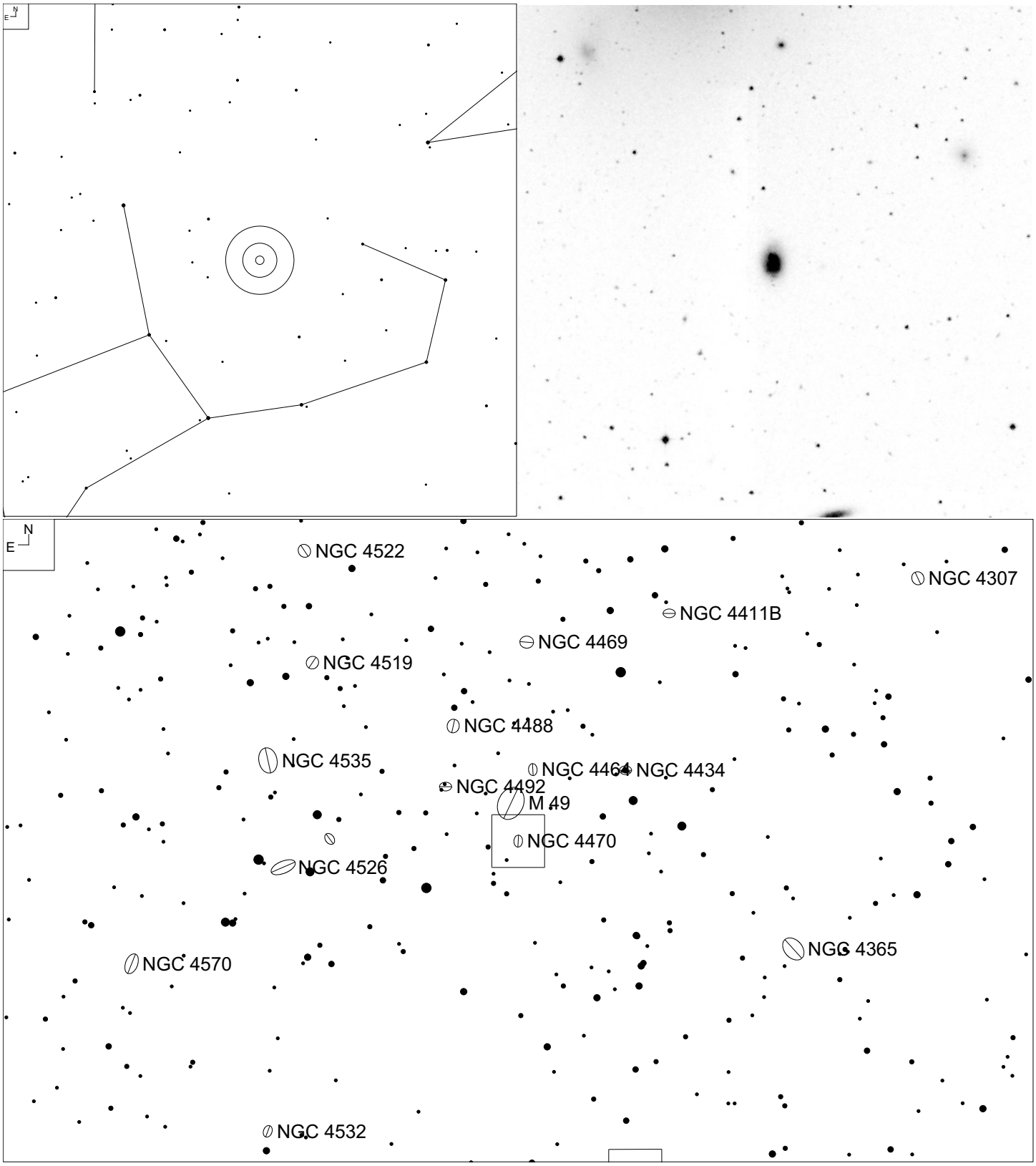






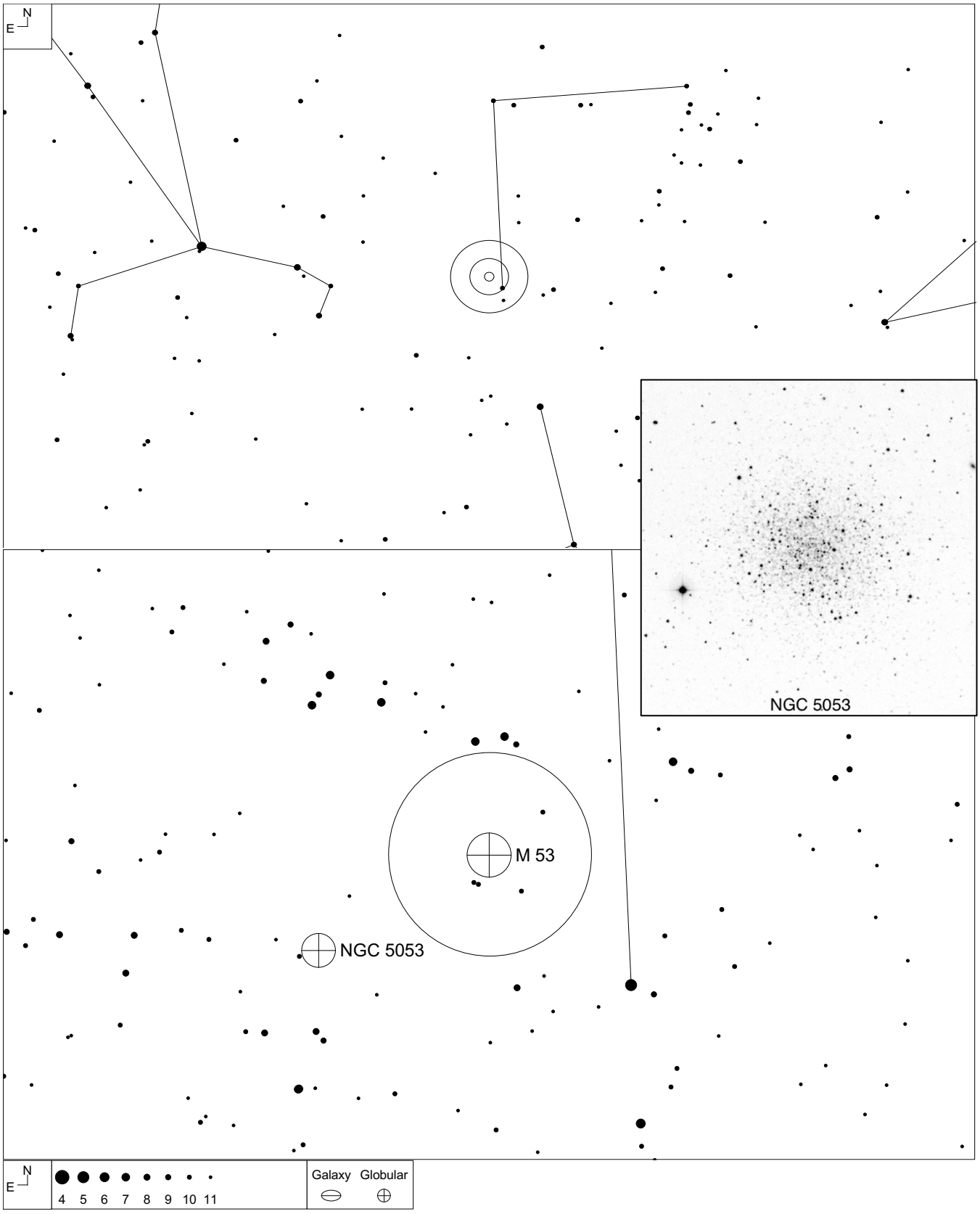
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
II-146	12 27 26.3	+06 15 48	11.8v	2.3 x 2.0’	SB(rs)b	91	57, D3

NGC 4470 (Virgo)



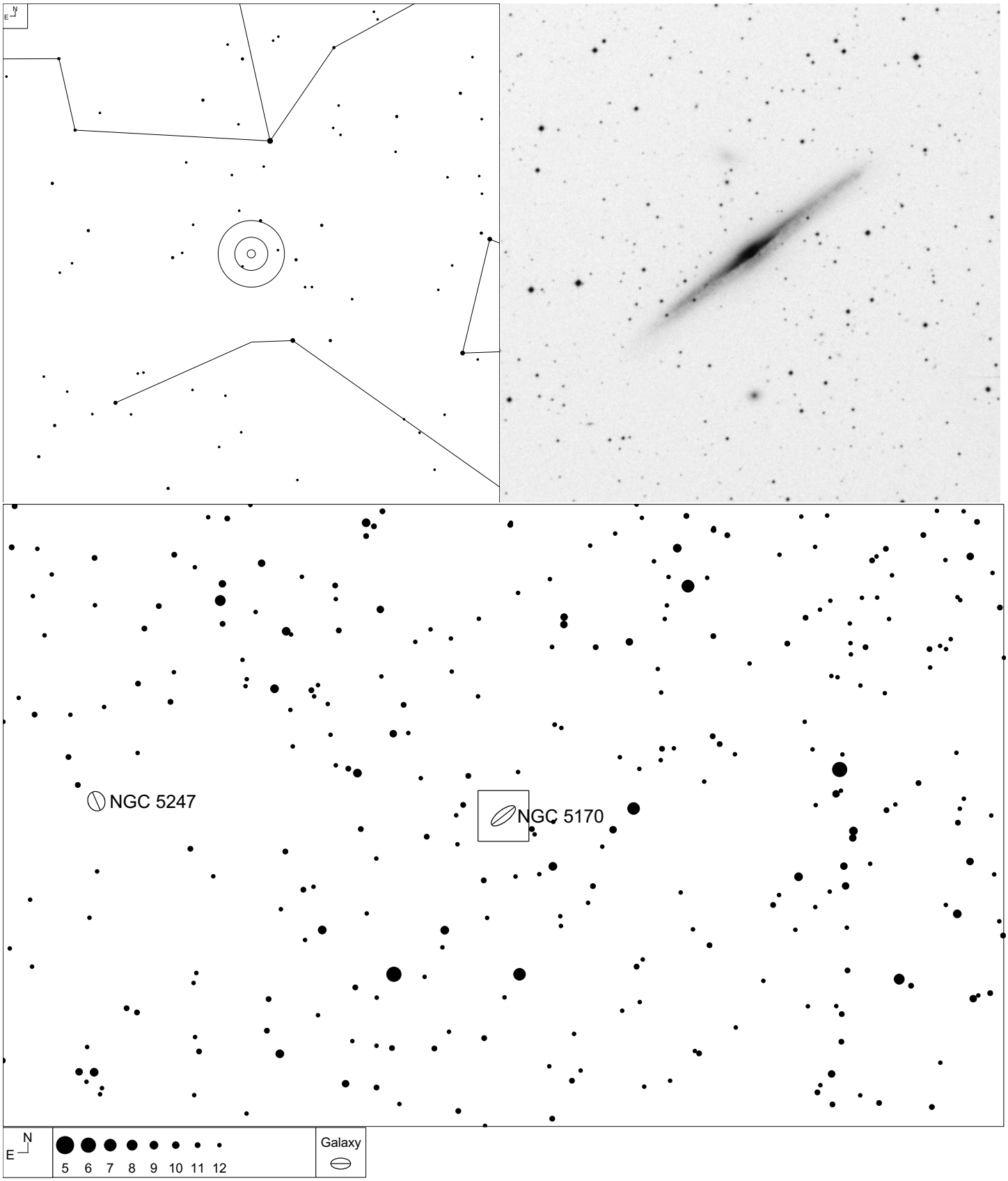
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
II-18/19	12 29 37.9	+07 49 25	12.9b	1.4 x 0.9’	Sa?	91	57, D3

NGC 5053 (Coma Berenices)



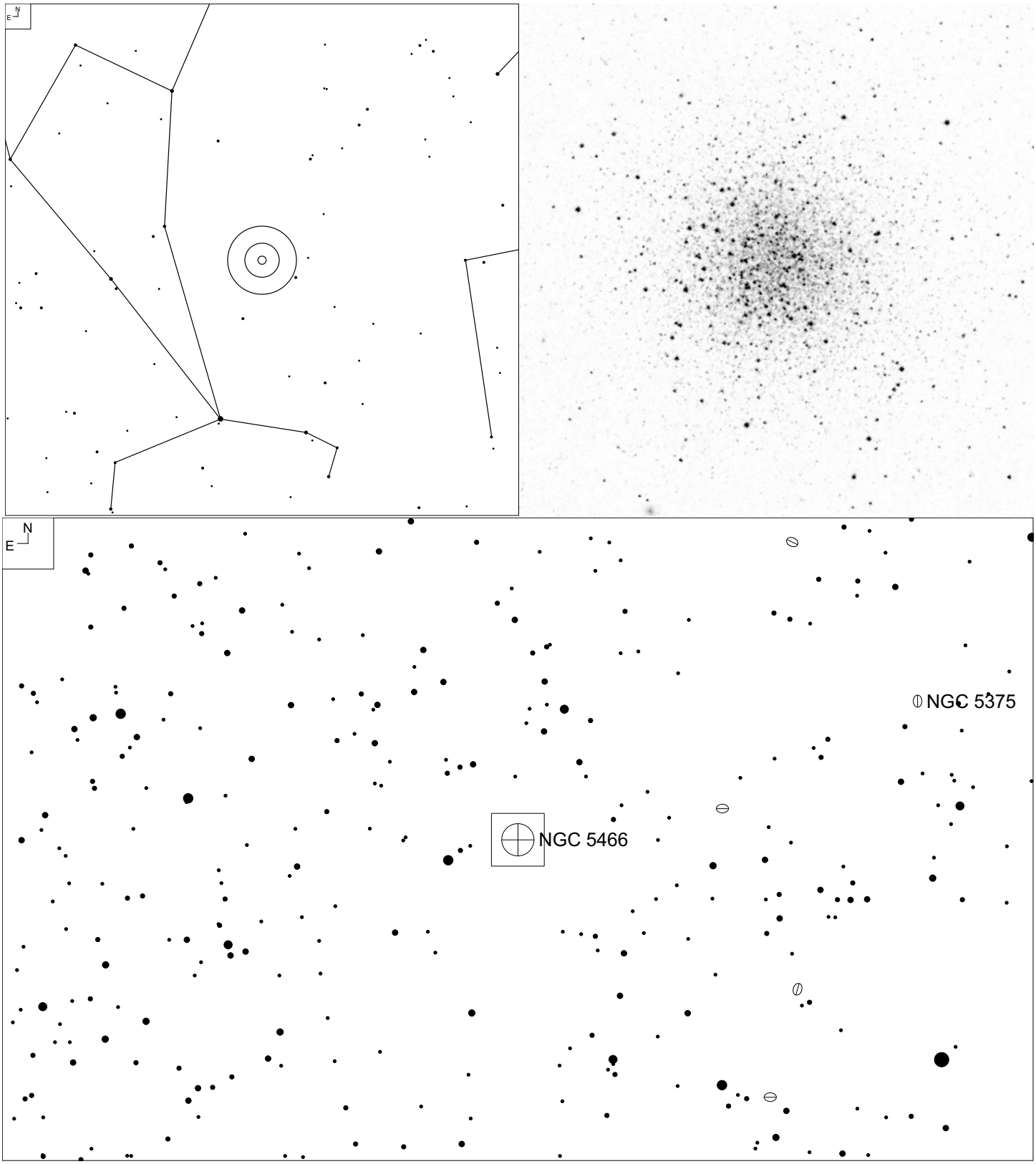
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
VI-7	13 16 27.0	+17 41 53	9.96v	10.0’	--	90	45

NGC 5170 (Virgo)



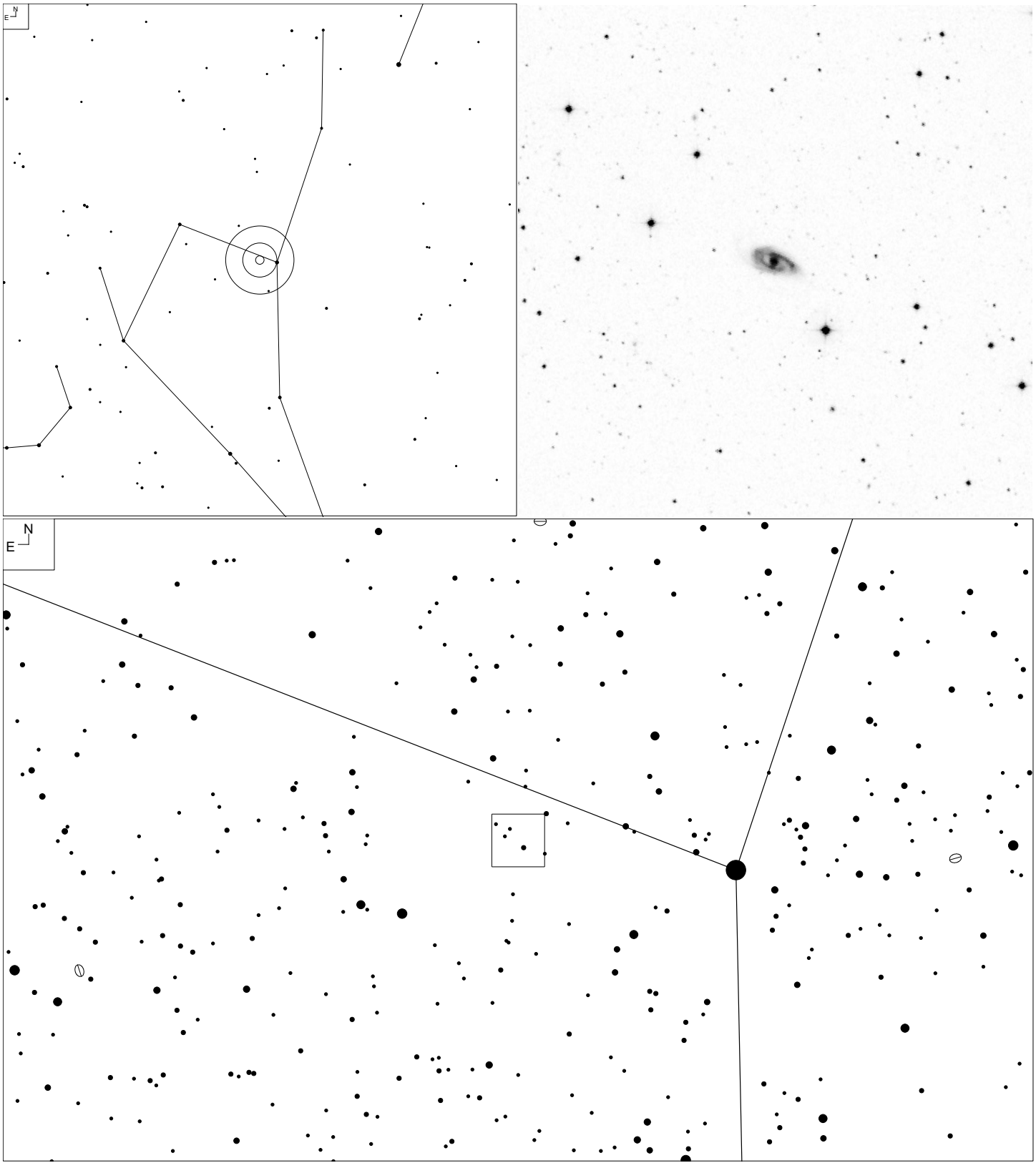
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
V-22	13 29 49.0	-17 57 59	10.8v	8.4 x 1.0’	SA(s)c: sp	130	69

NGC 5466 (Boötes)



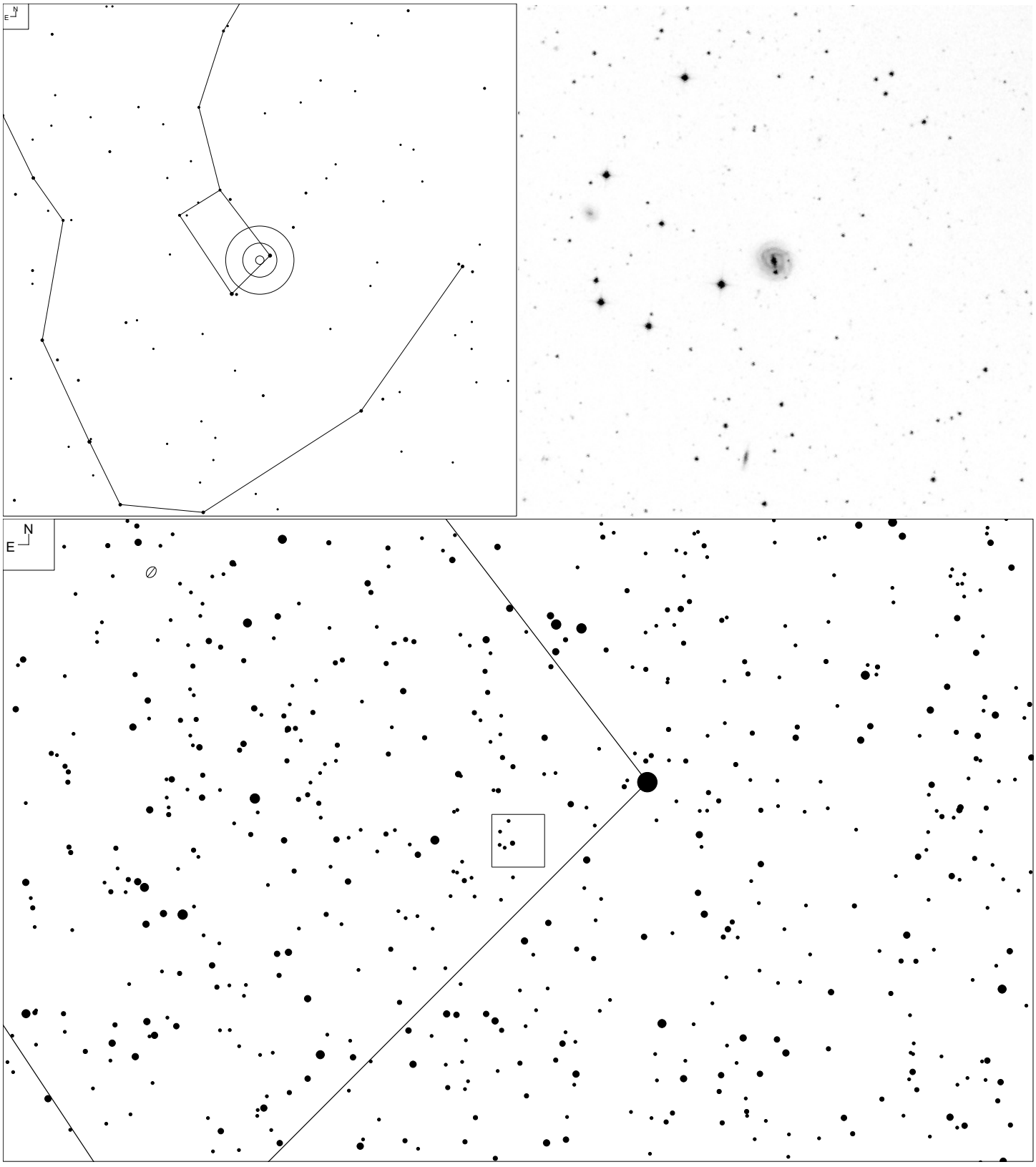
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
VI-9	14 05 27.3	+28 32 04	9.7v	9.0’	XII	70	32

NGC 5698 (Boötes)



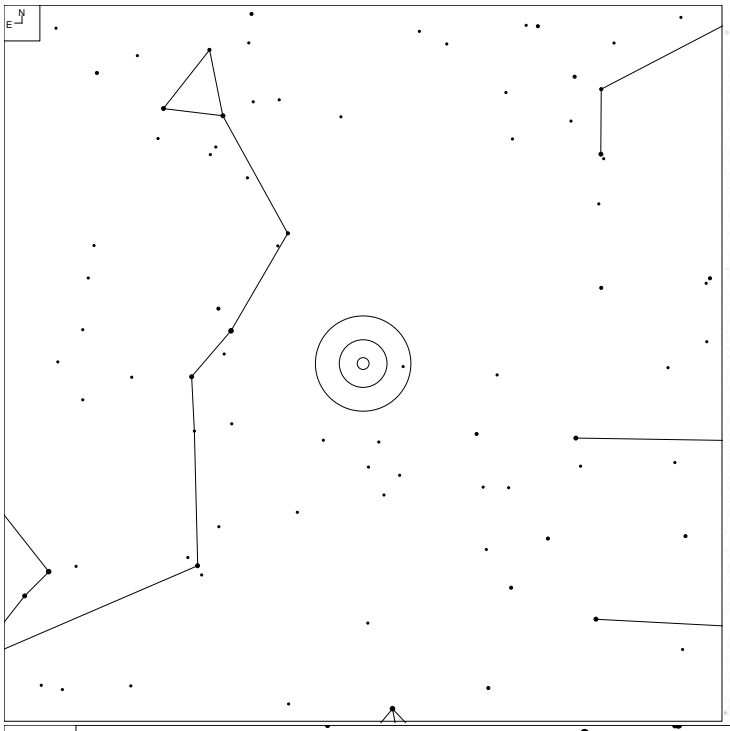
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
II-700	14 37 14.7	+38 27 14	14.0b	2.2 x 0.9’	SBp	52	20

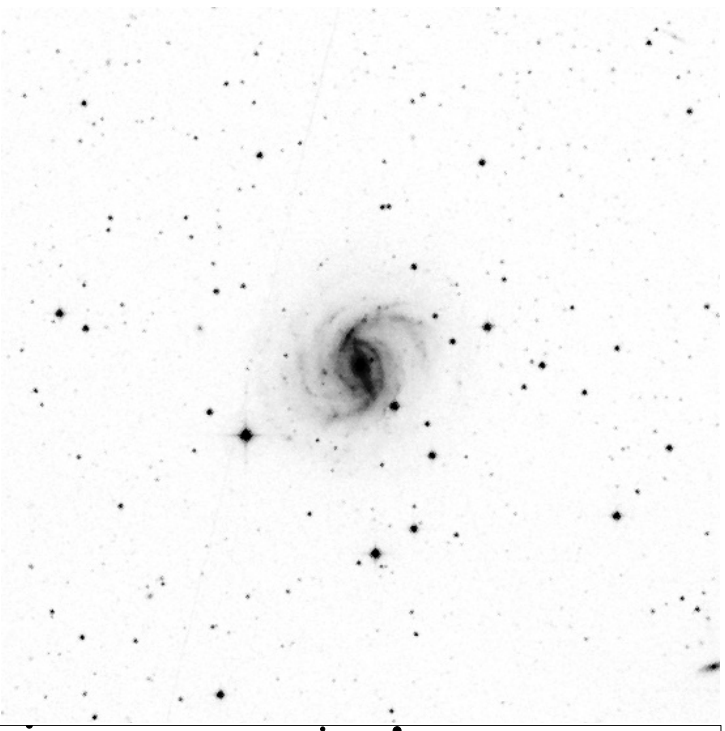
NGC 5836 (Ursa Minor)

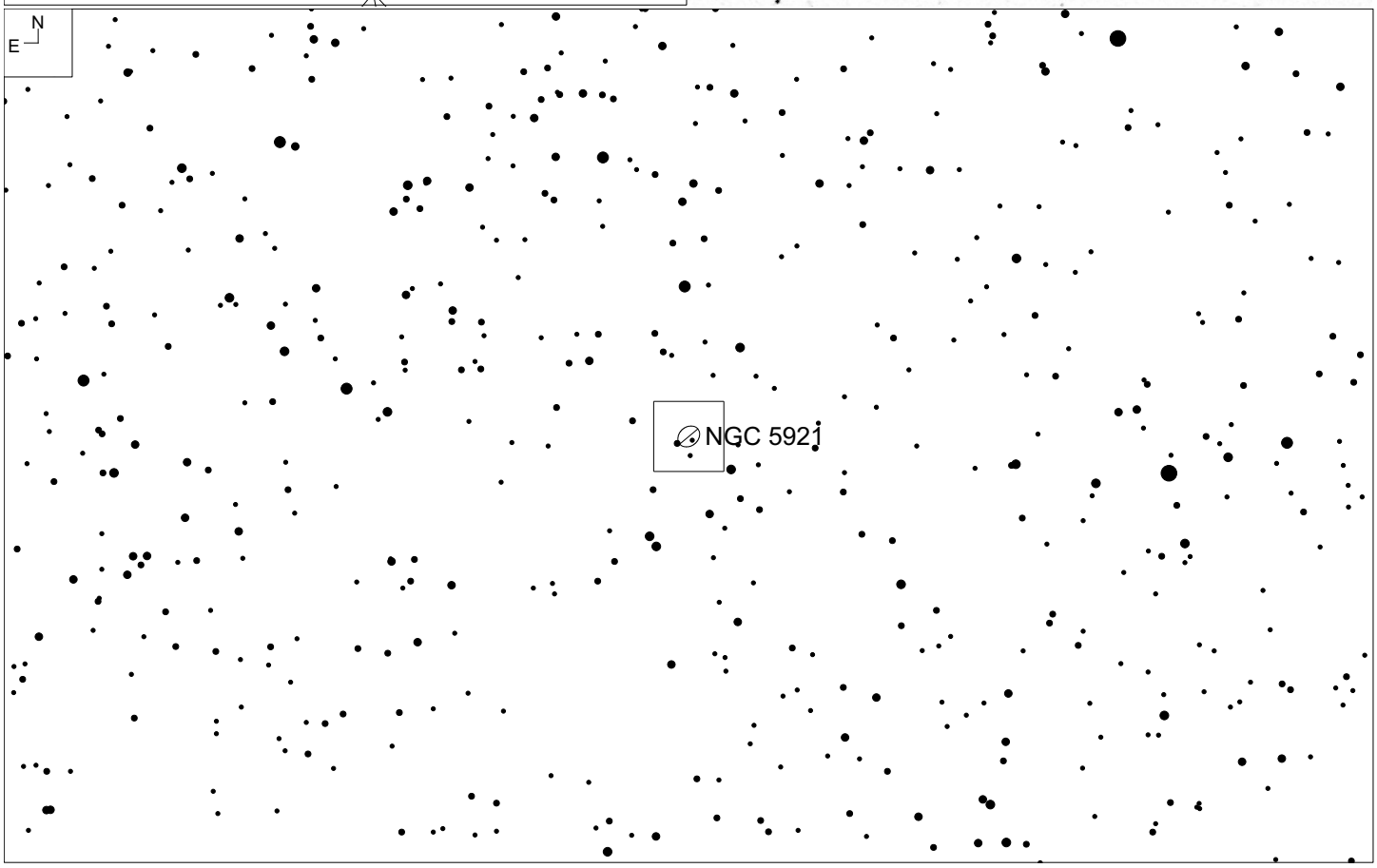


Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
III-312	14 59 31.1	+73 53 35	14.9b	1.1 x 0.9’	SC(rs)b	4	4

NGC 5921 (Serpens)

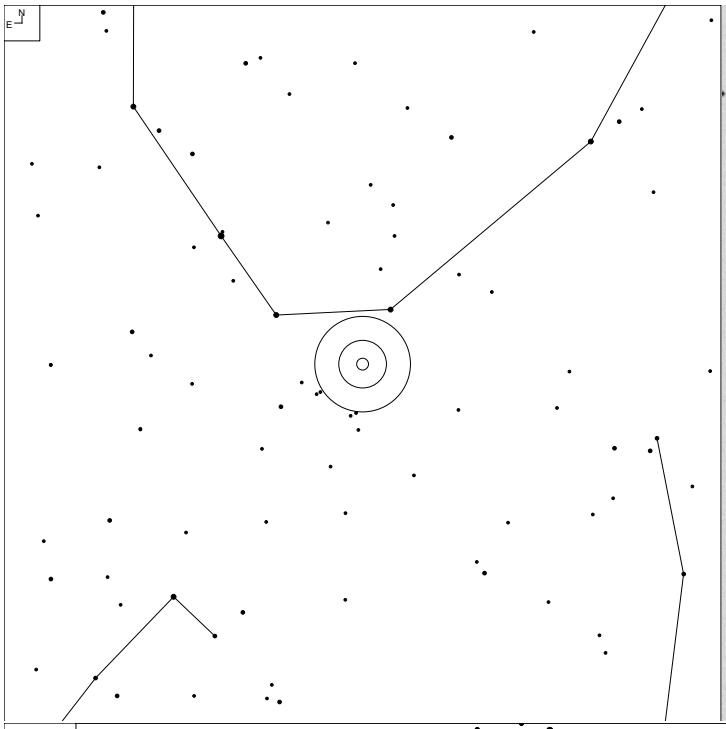


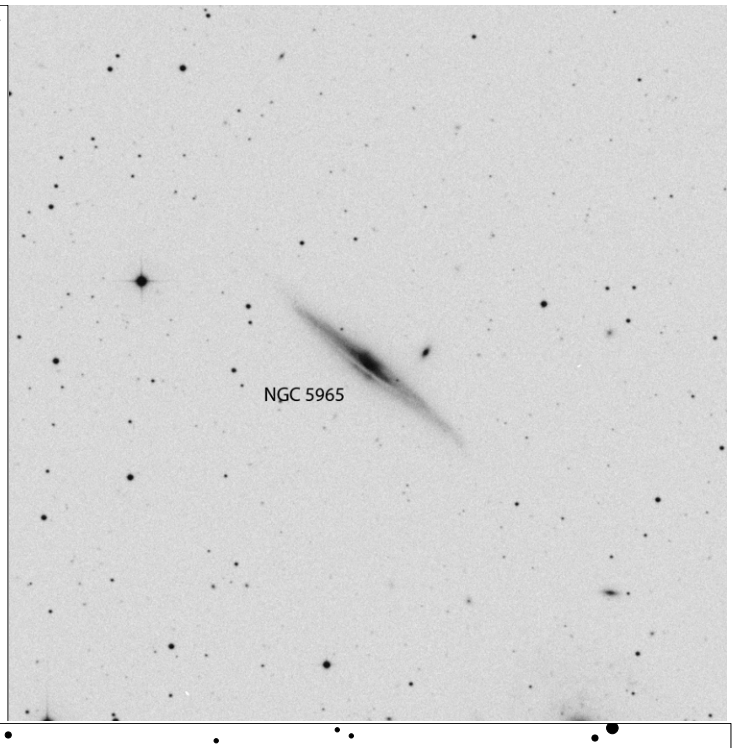


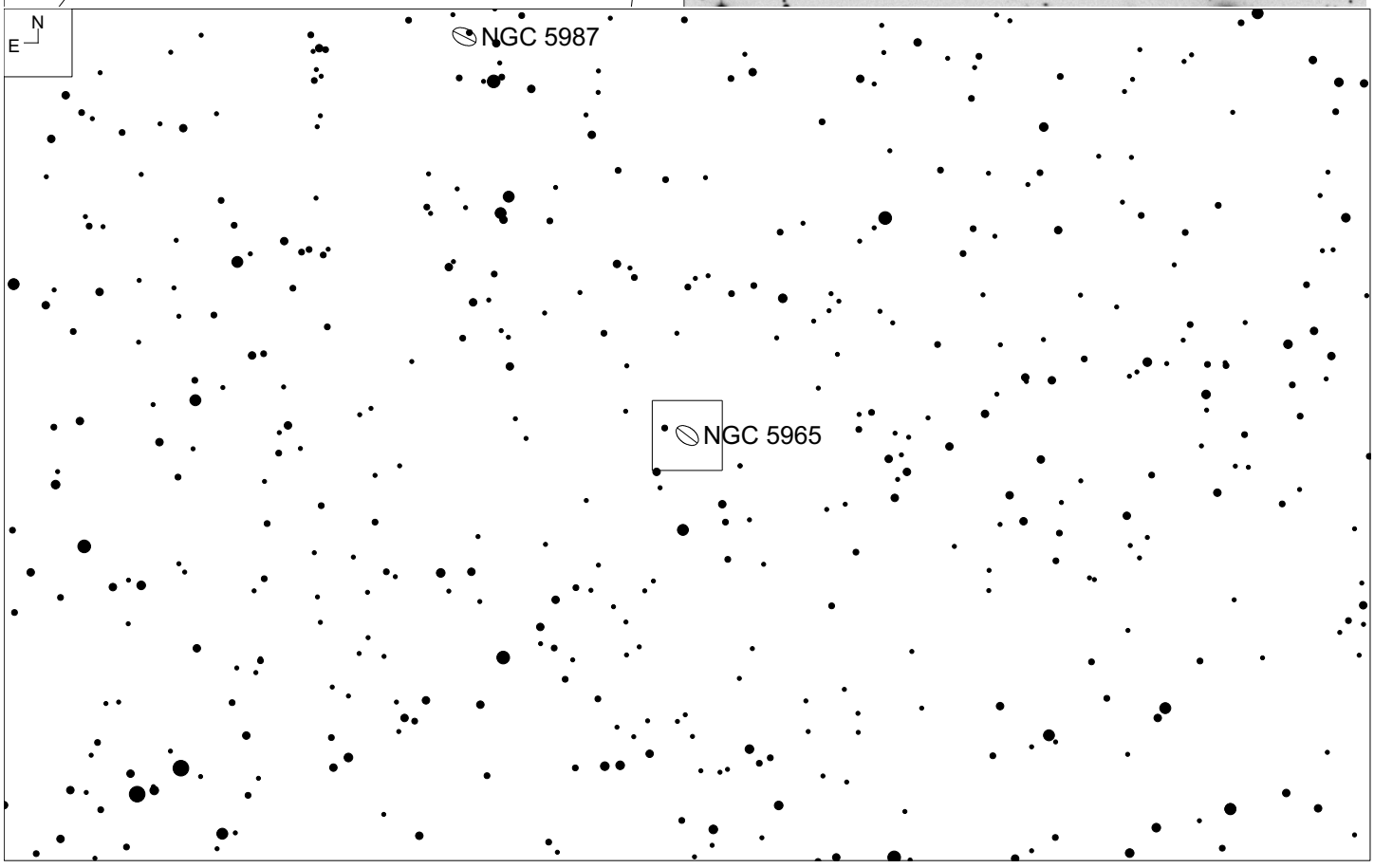


Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
I-148	15 21 56.5	+05 04 13	12.7b	4.9 x 3.9’	SC(r)bc	108	56

NGC 5965 (Draco)

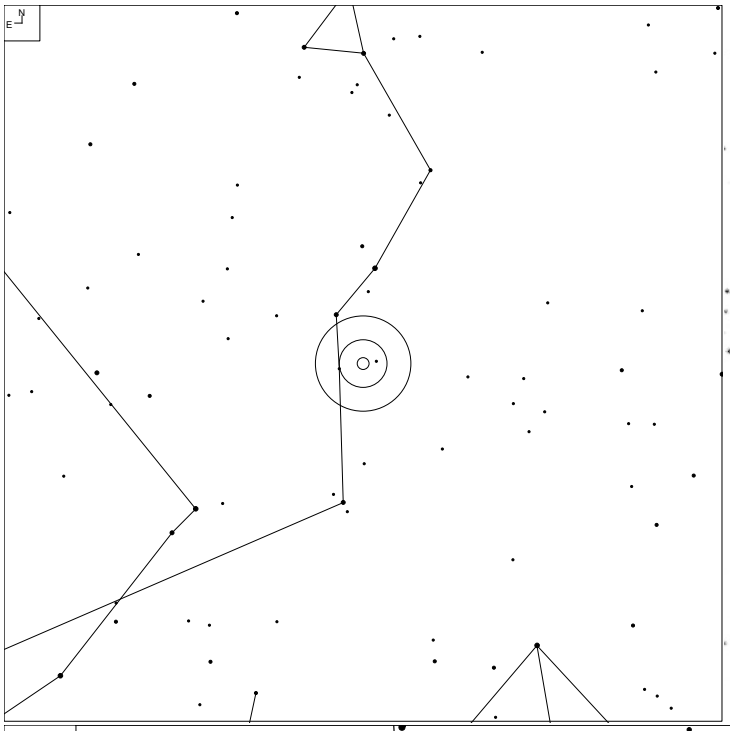


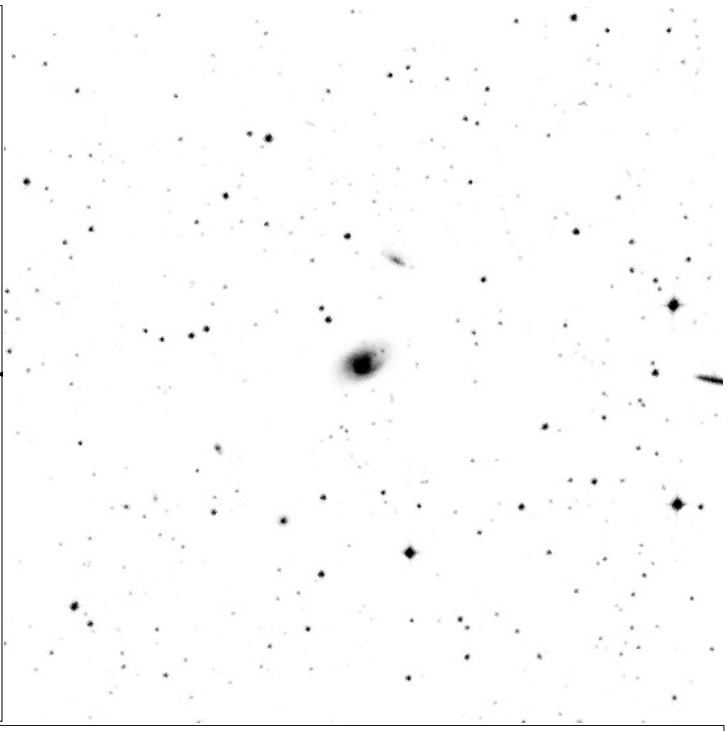


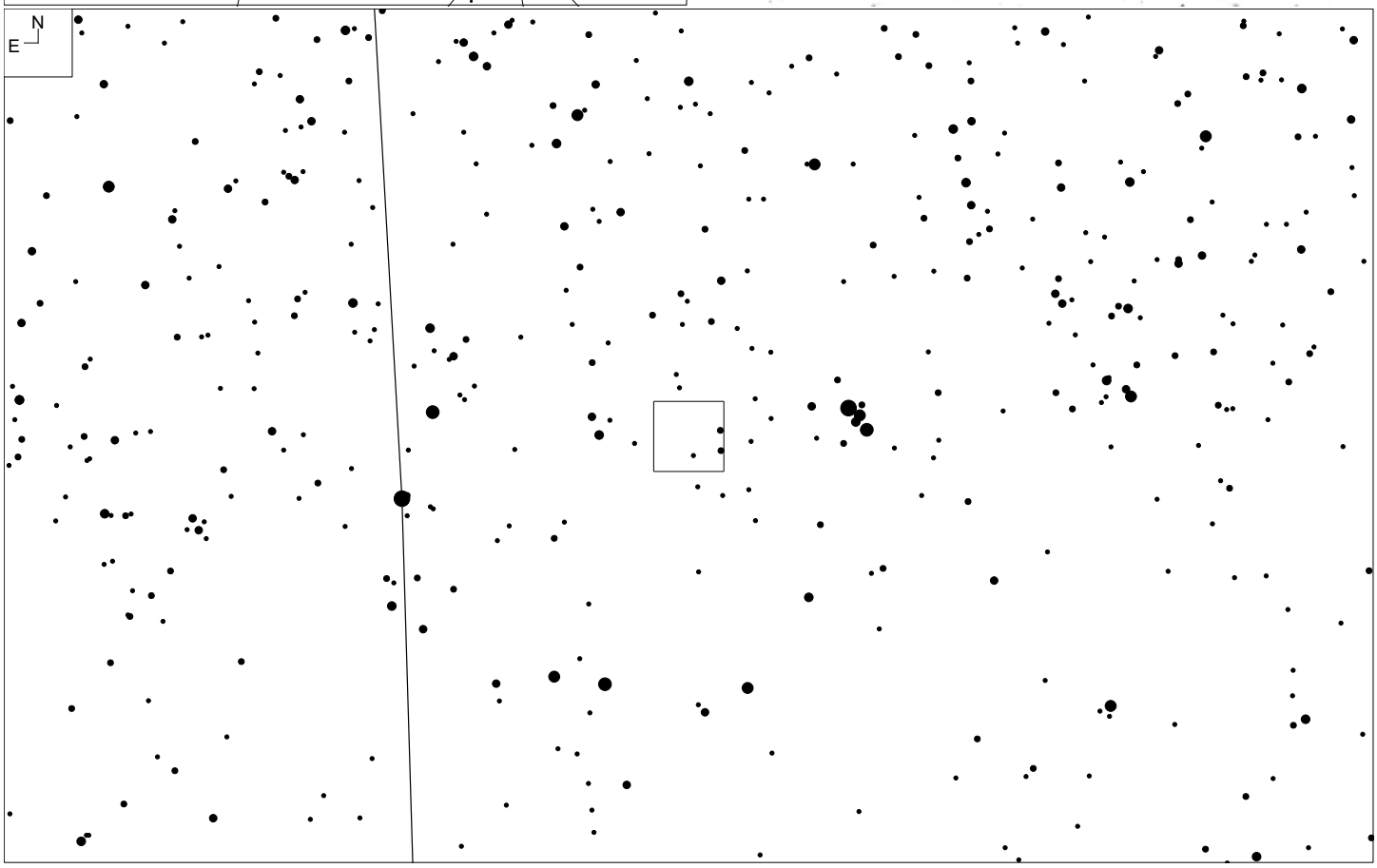


Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
II-762	15 34 02.2	+56 41 08	13.4b	5.2 x 0.7’	Sb	22	10

NGC 5990 (Serpens)

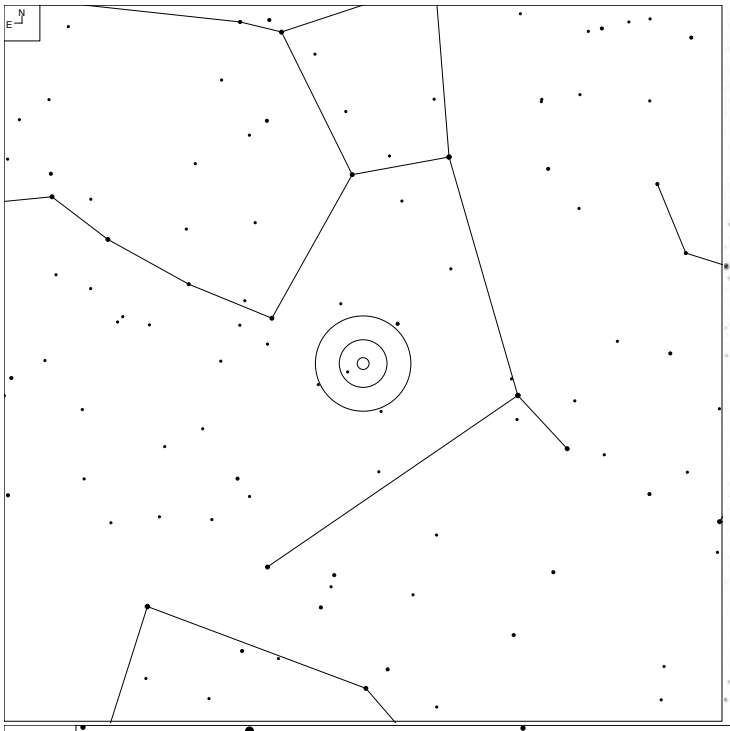


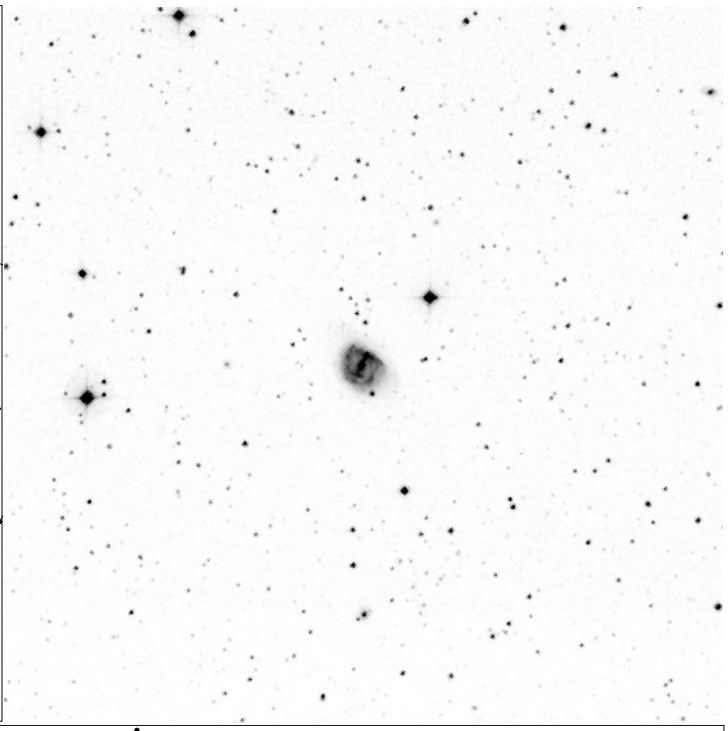


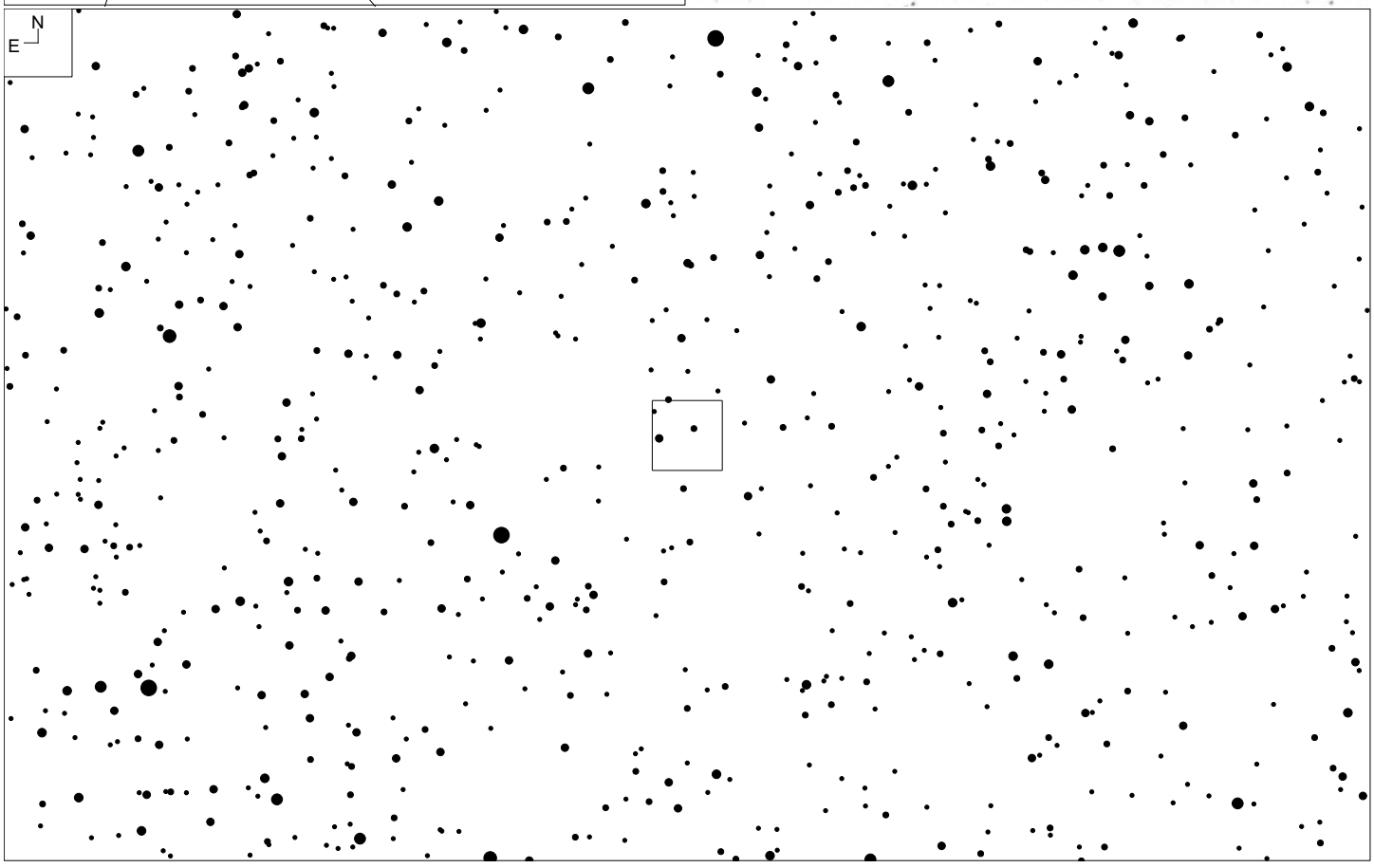


Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
II-425	15 46 16.3	+02 24 56	13.1b	1.5 x 0.8’	(R)Sa pec?	108	56

NGC 6267 (Hercules)

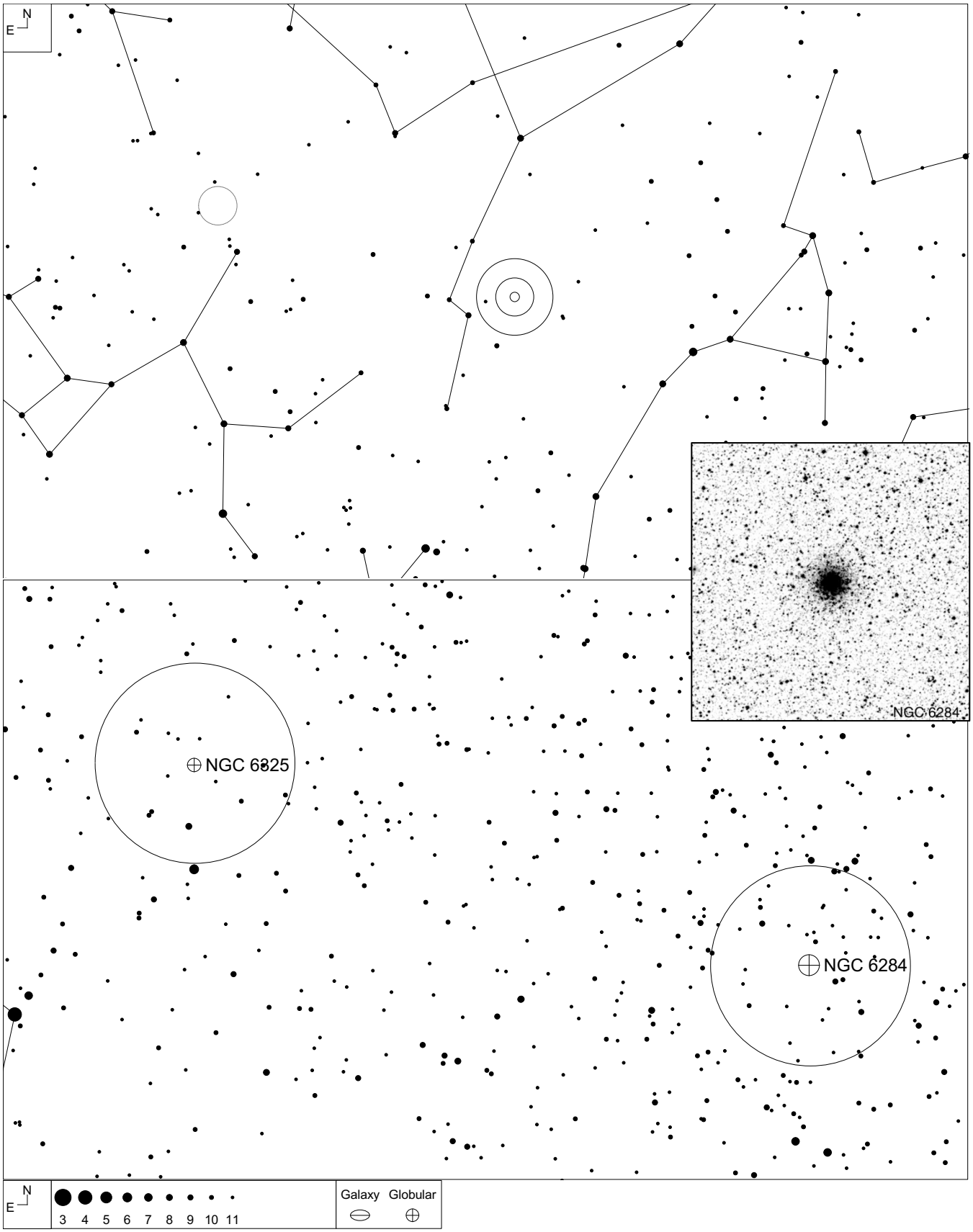






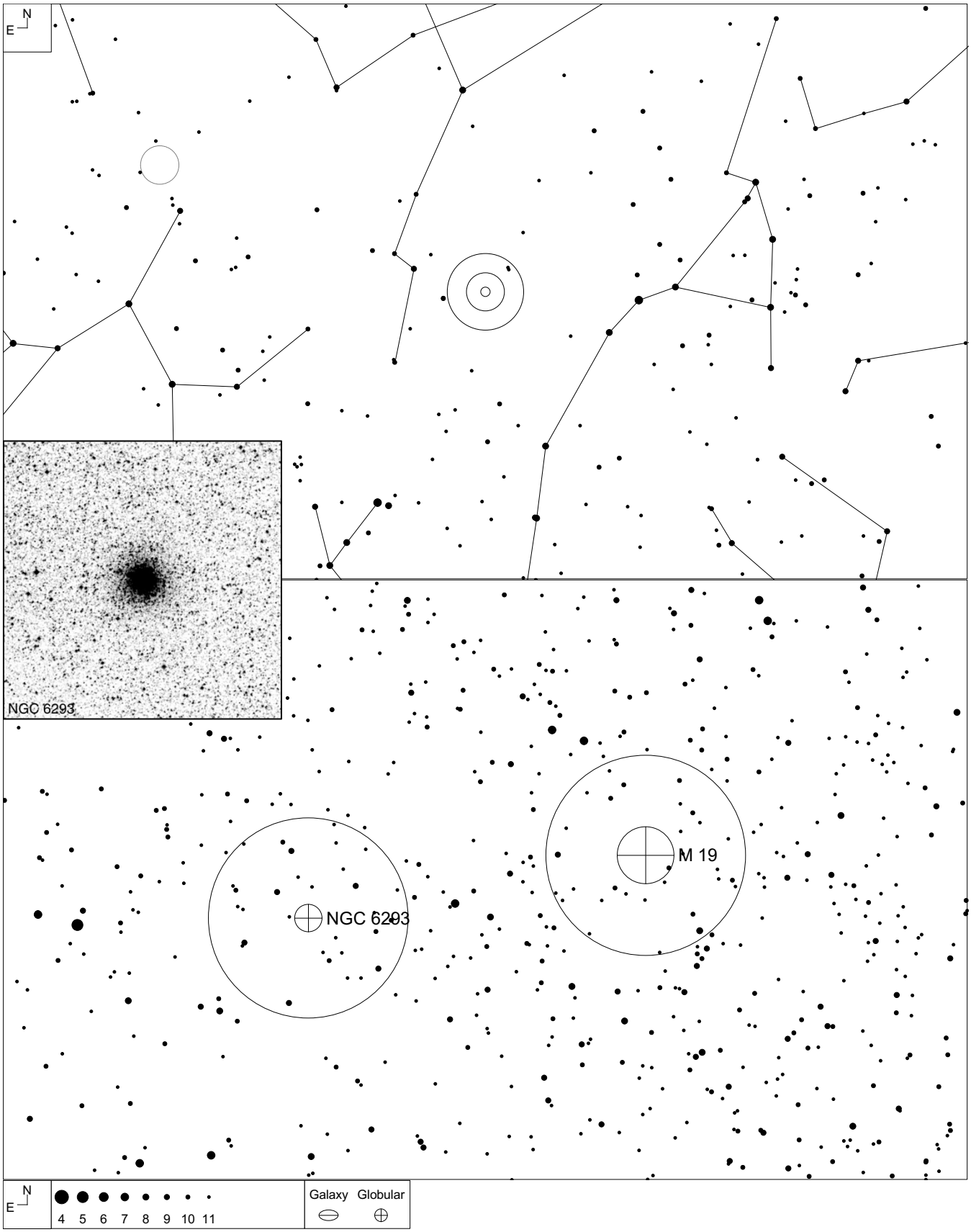
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
III-123	16 58 08.6	+22 59 04	14.0b	1.3 x 1.0’	SB(r)bc	68	31

NGC 6284 (Ophiuchus)



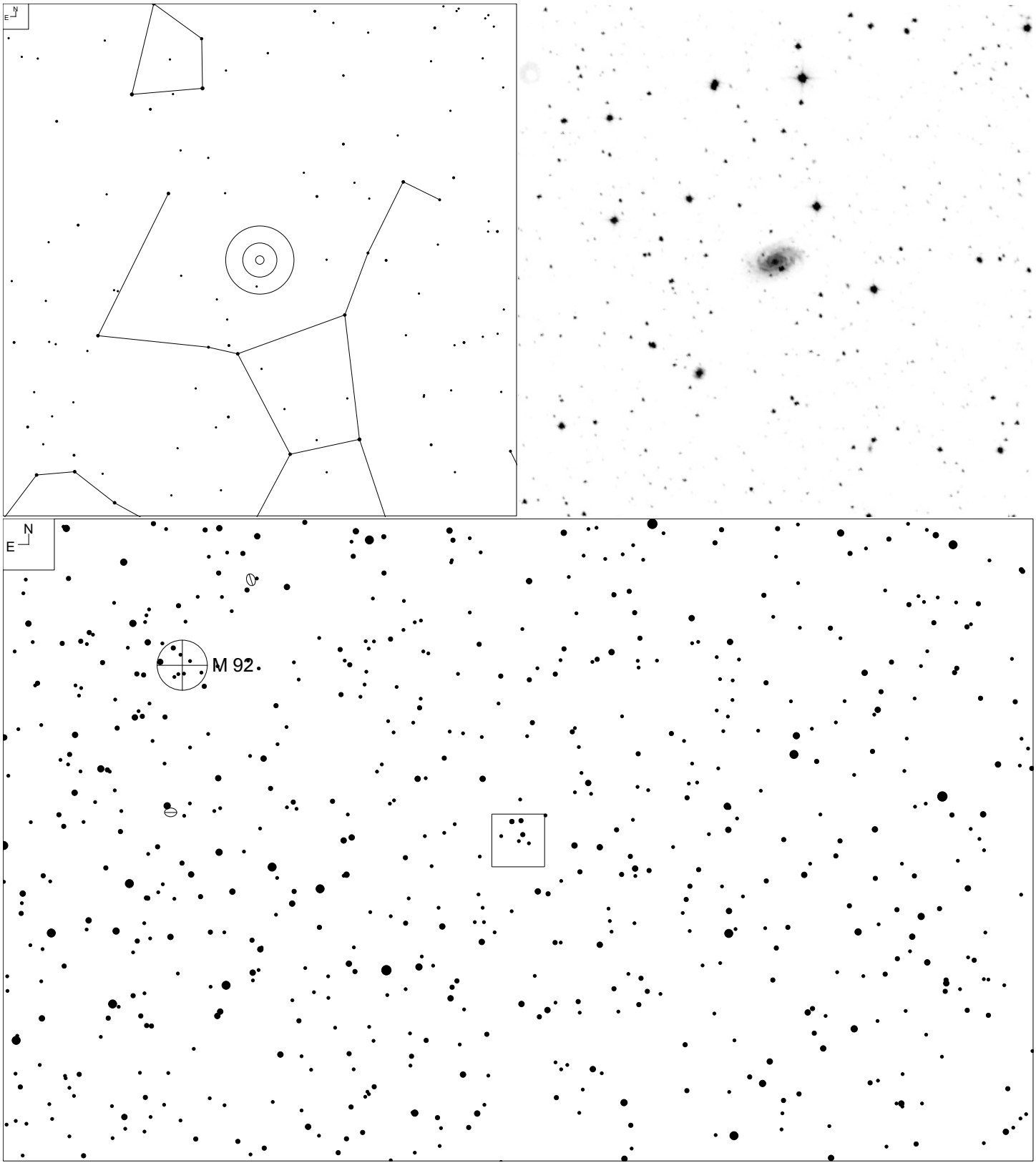
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
VI-11	17 04 28.8	-24 45 53	7.43v	6.2’	IX	146	79

NGC 6293 (Ophiuchus)



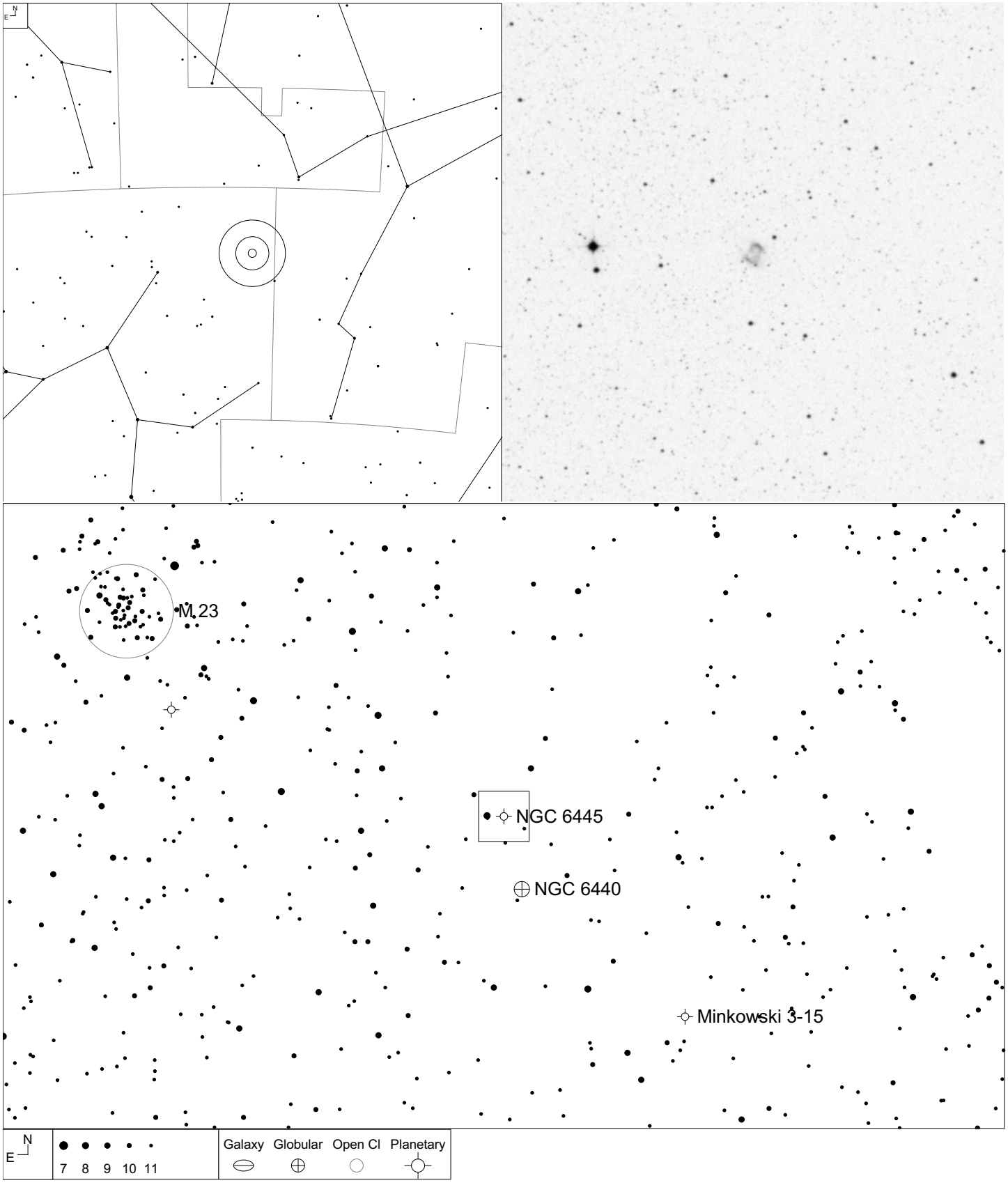
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
VI-12	17 10 10.4	-26 34 54	8.3	8.2’	IV	146	79

NGC 6301 (Hercules)



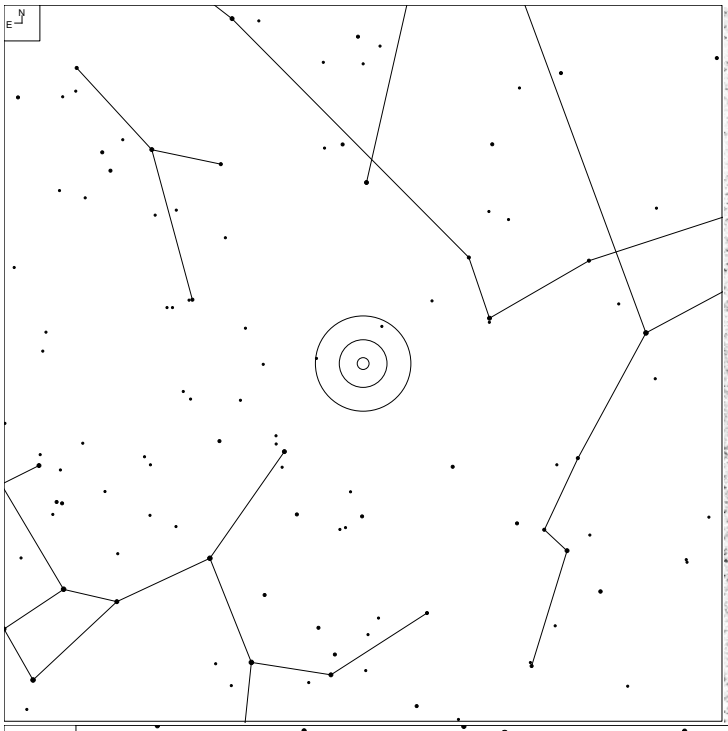
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
IV-57	17 08 32.9	+42 20 19	14.6b	2.3 x 1.4’	Scd	34	19

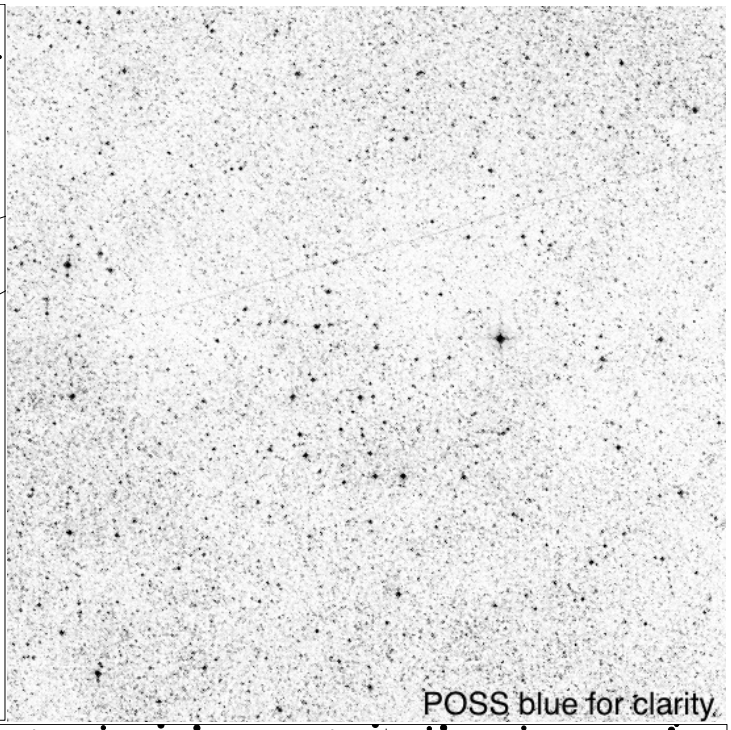
NGC 6445 (Sagittarius)

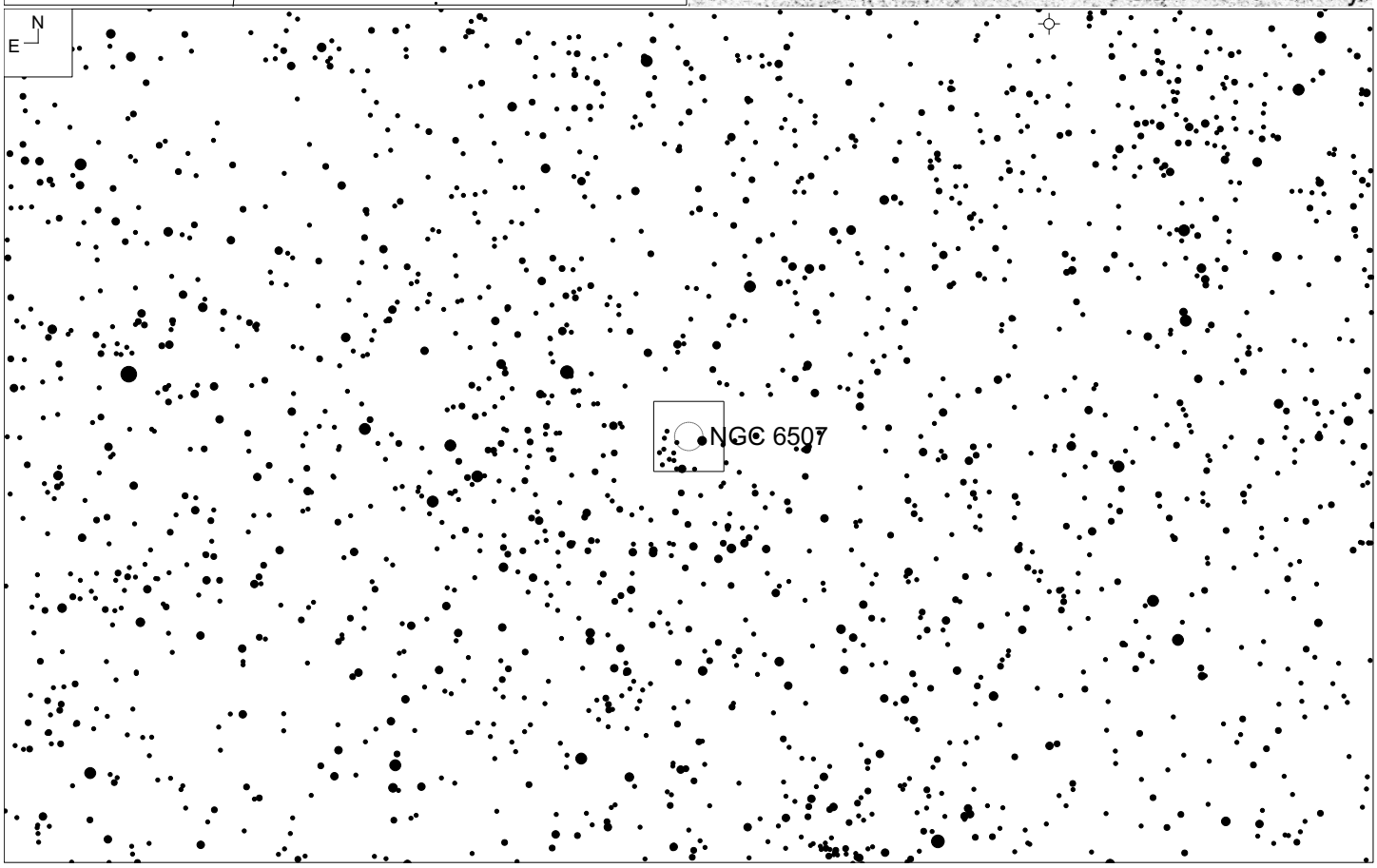


Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
II-586	17 49 14.9	-20 00 36	13.2p	44 x 50”	IIIb+II	146	67

NGC 6507 (Sagittarius)

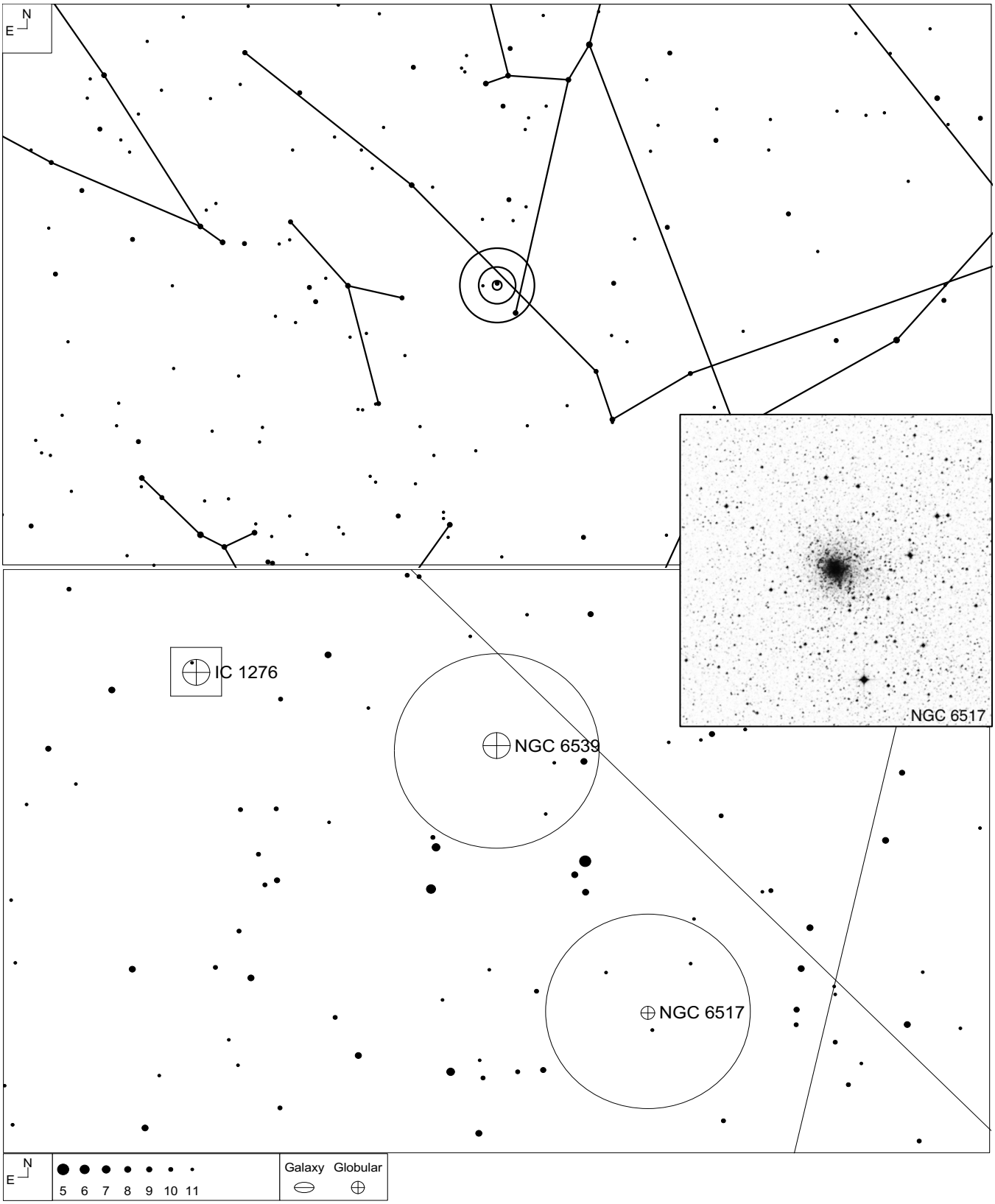






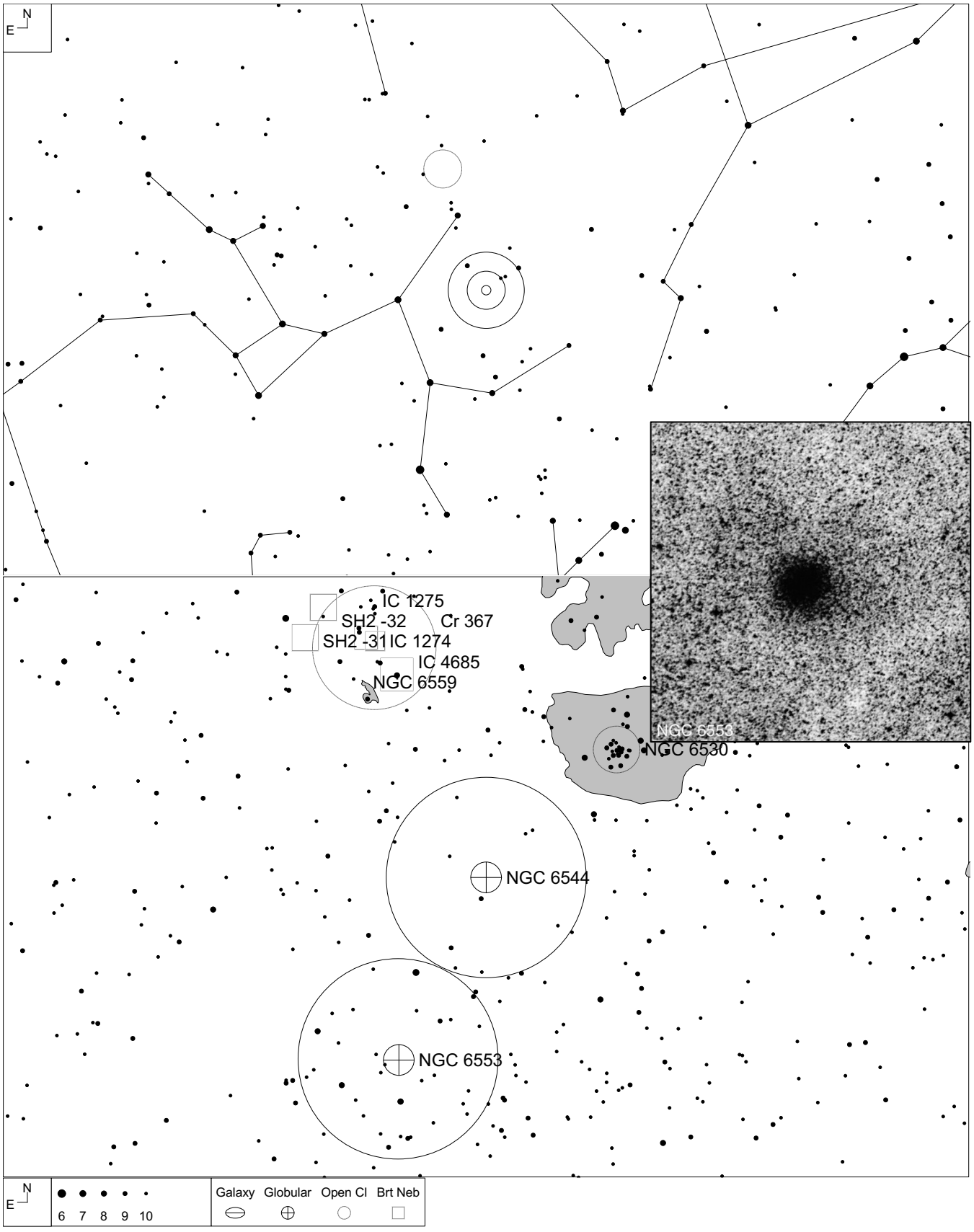
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
VIII-53	17 59 36.0	-17 23 00	9.5v	6.0’	IV 3 m	126	67

NGC 6517 (Ophiuchus)



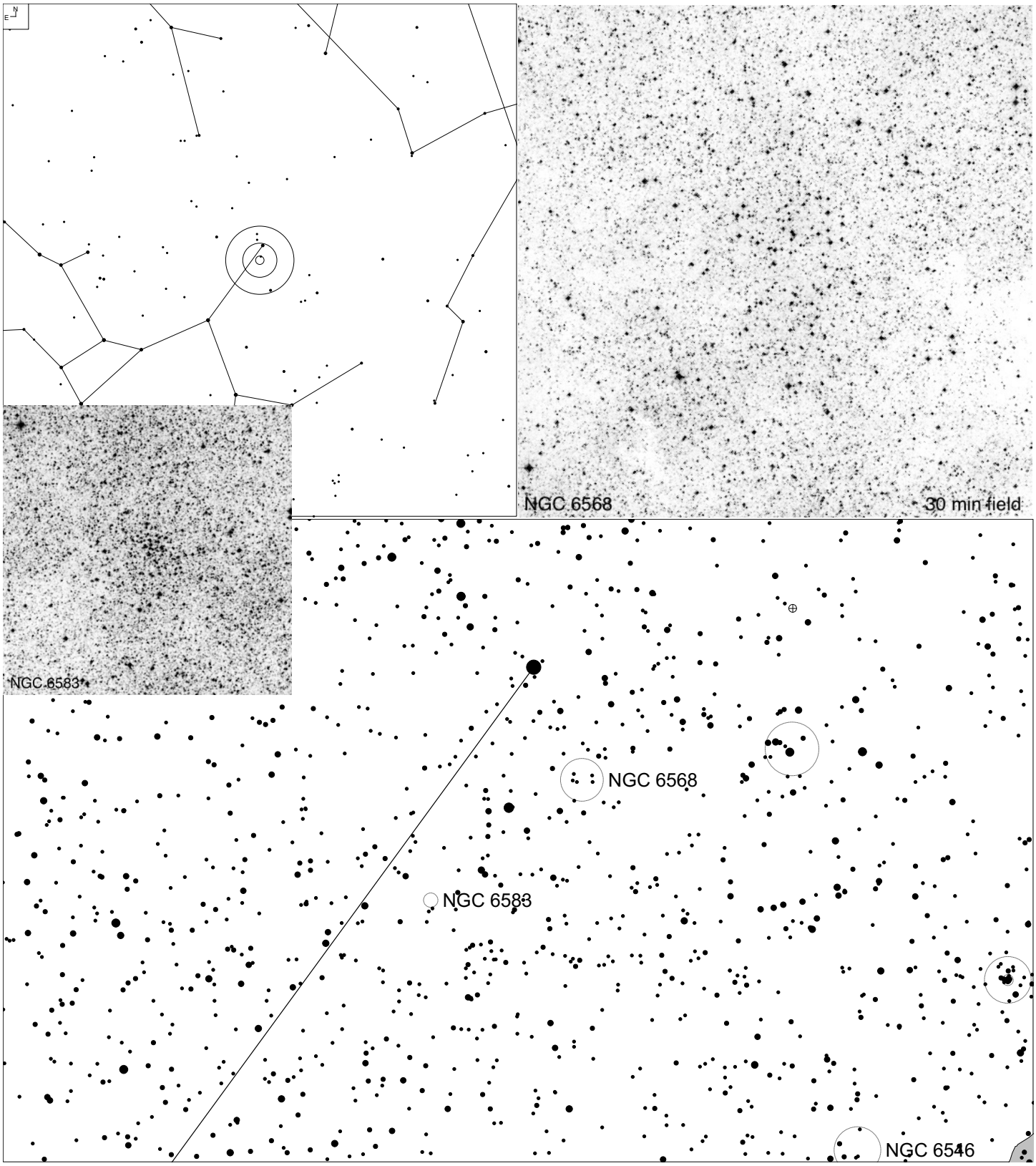
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
II-199	18 01 50.6	-08 57 32	11.8b	4.0’	--	126	66

NGC 6553 (Sagittarius)



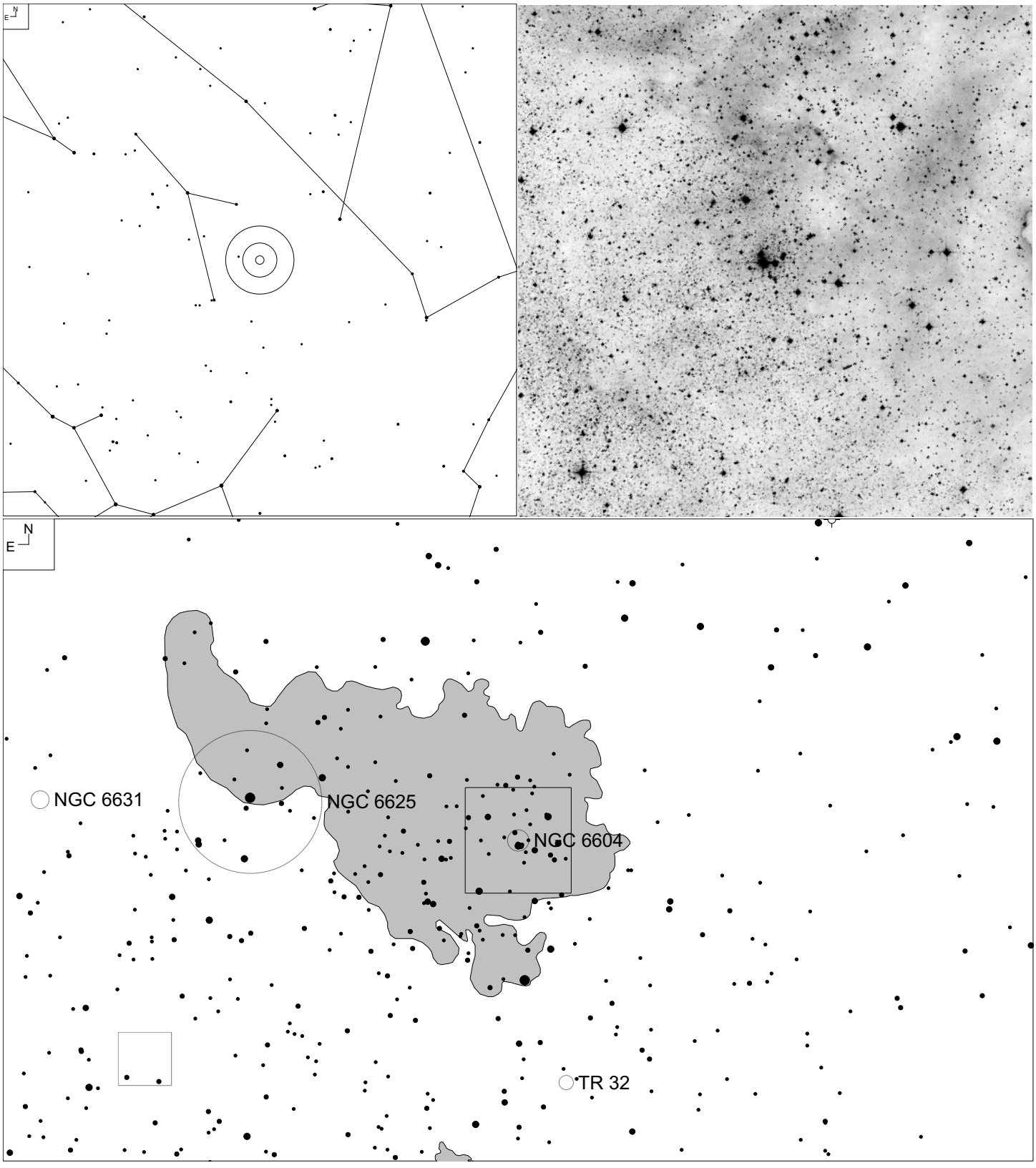
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
IV-12	18 09 17.3	-25 54 28	9.1b	8.3’	V	145	78

NGC 6568 and 6583 (Sagittarius)



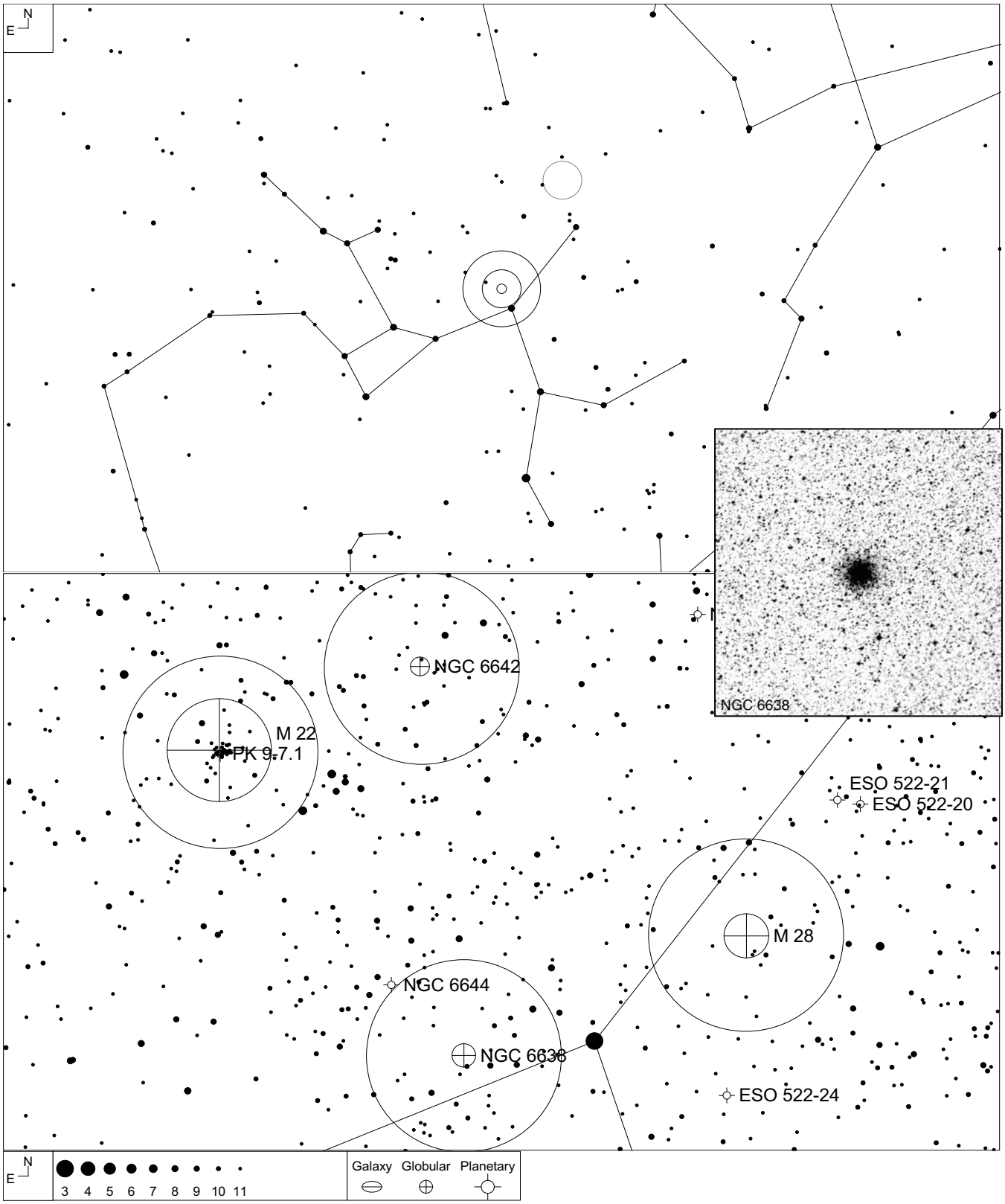
	Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
NGC 6568	**VII-30**	18 12 48.0	-21 35 00	8.6	12.0’	IV 1 m	145	66
NGC 6583	**VII-31**	18 15 50.2	-22 08 38	10.0v	4.0’	I 2 m	145	66

NGC 6604 (Serpens)



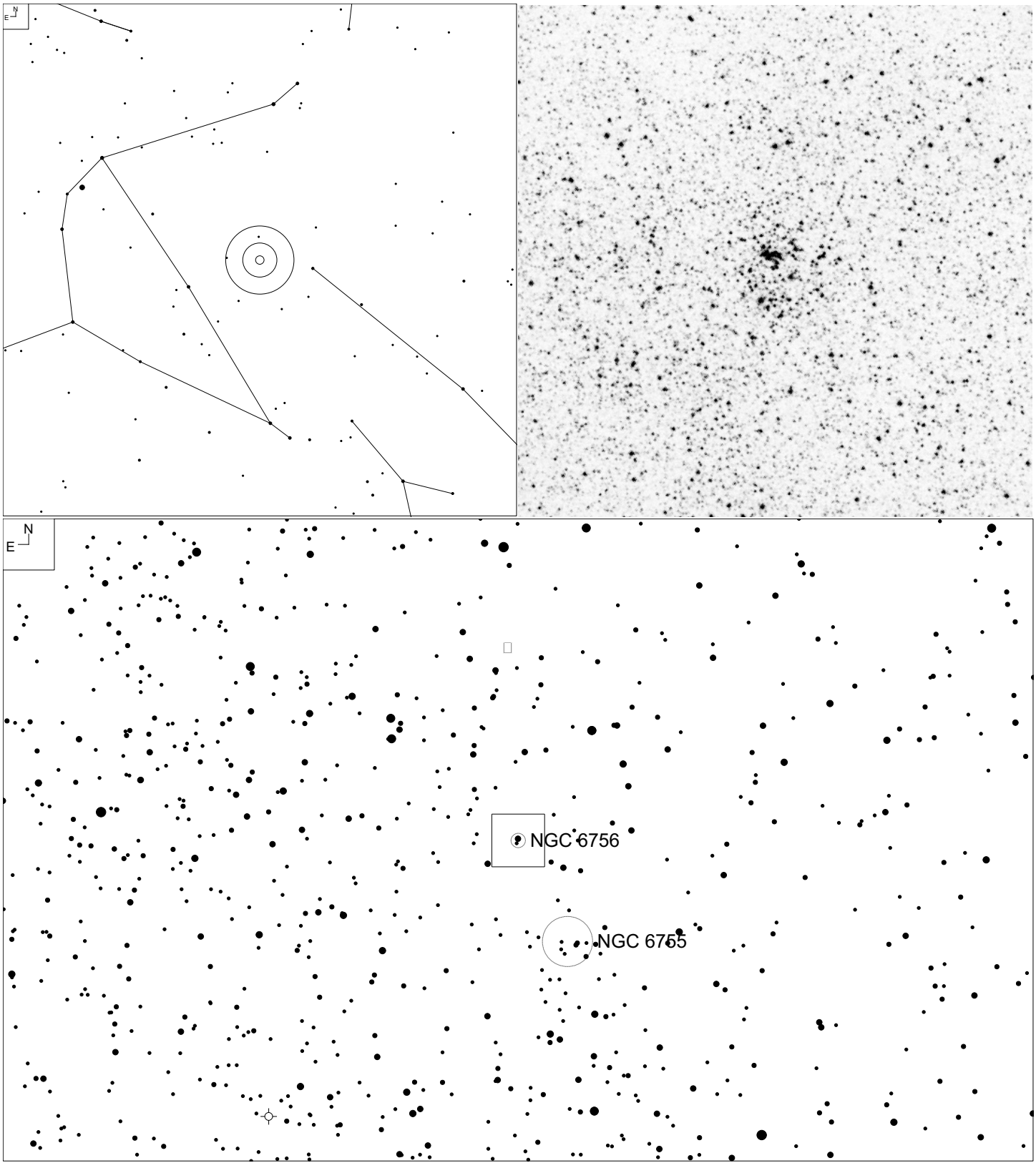
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
VIII-15	18 18 06.0	-12 13 00	6.5	6.0’	I 2 m n	126	66

NGC 6638 (Sagittarius)



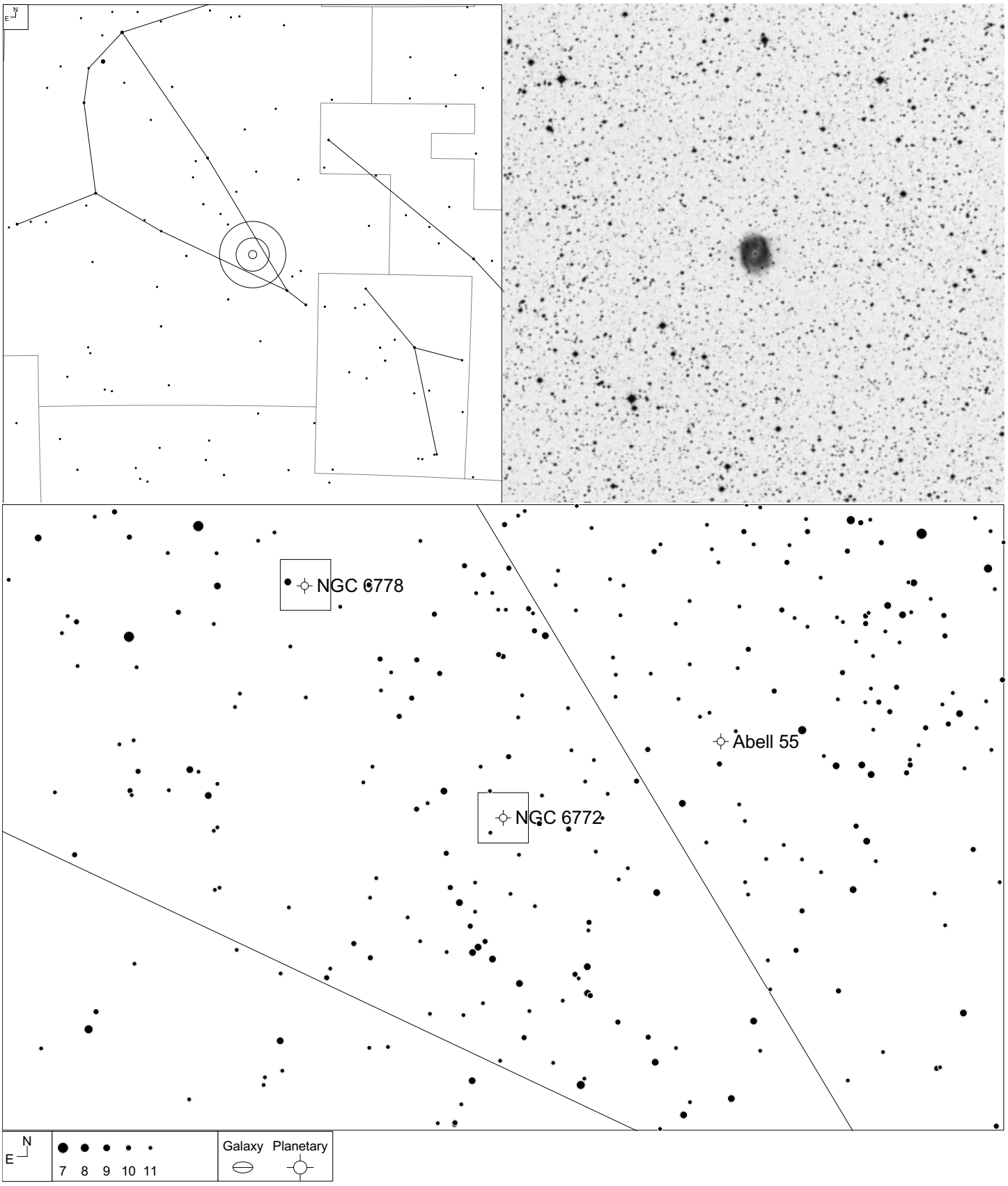
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
I-51	18 30 56.2	-25 29 47	9.68v	7.3’	VI	145	78

NGC 6756 (Aquila)



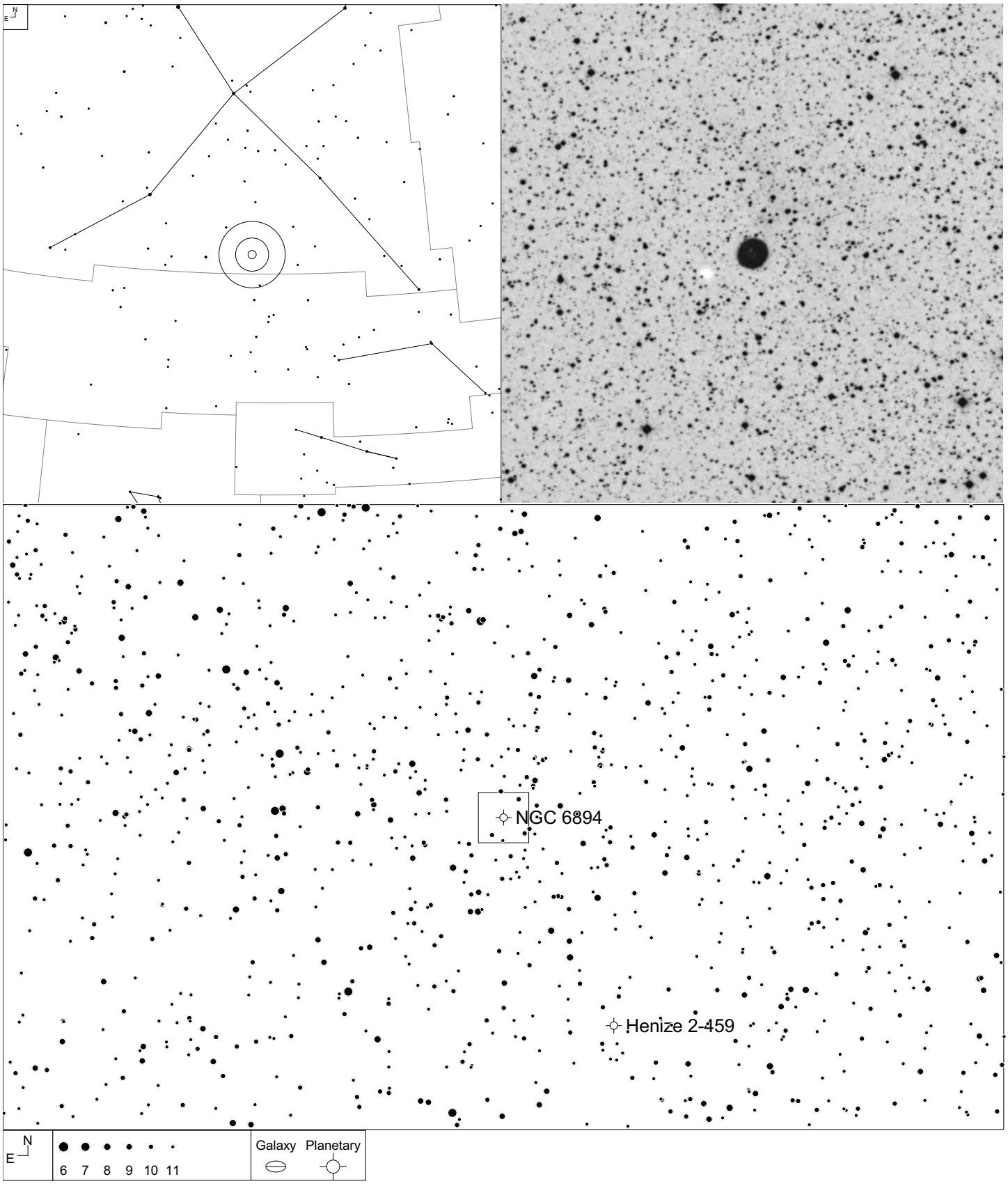
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
VII-62	19 08 43.3	+04 42 19	10.6v	4.0’	I 1 m	105	54

NGC 6772 (Aquila)



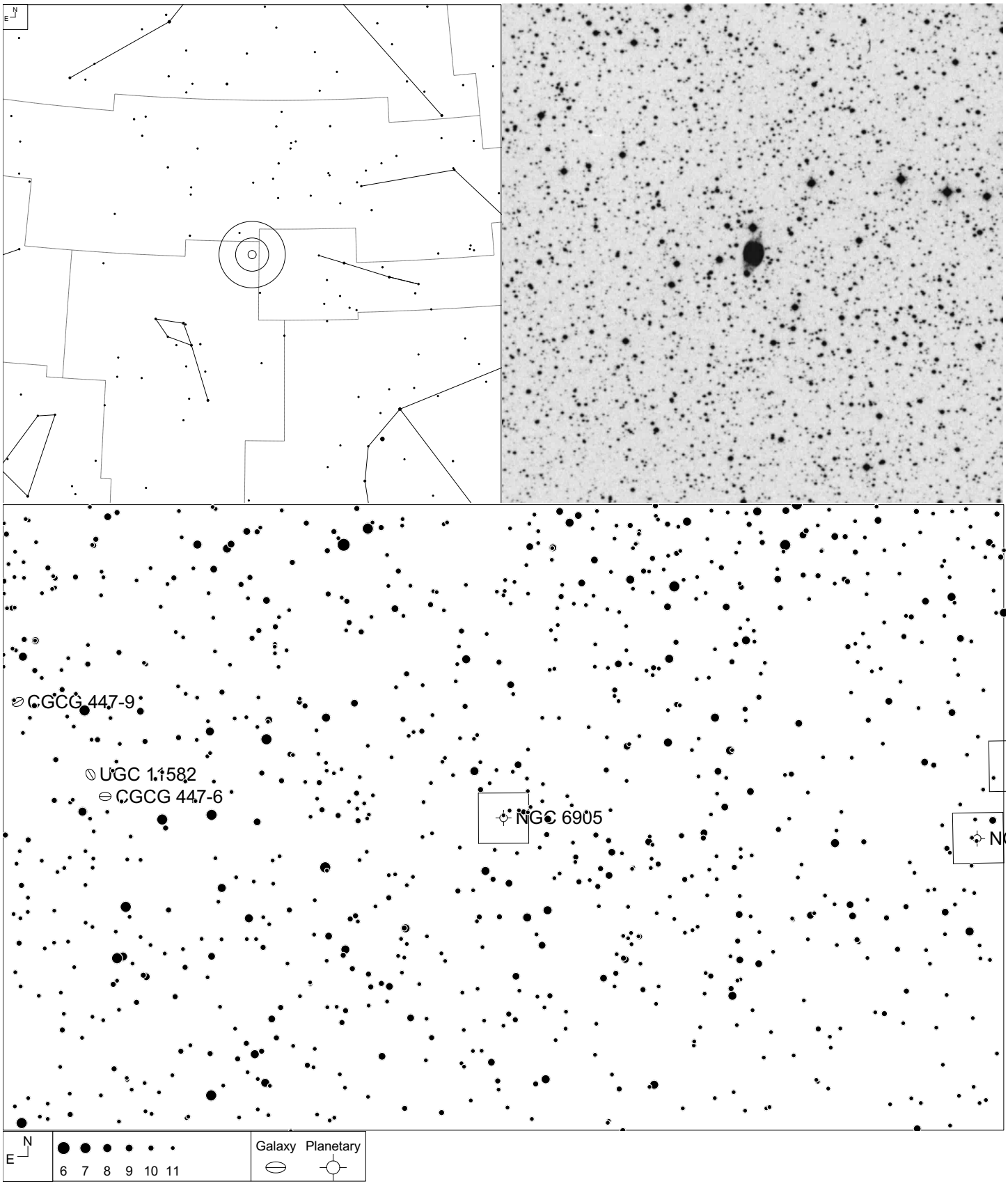
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
IV-14	19 14 36.4	-02 42 27	14.2p	84”	IIIb+II	105	54

NGC 6894 (Cygnus)



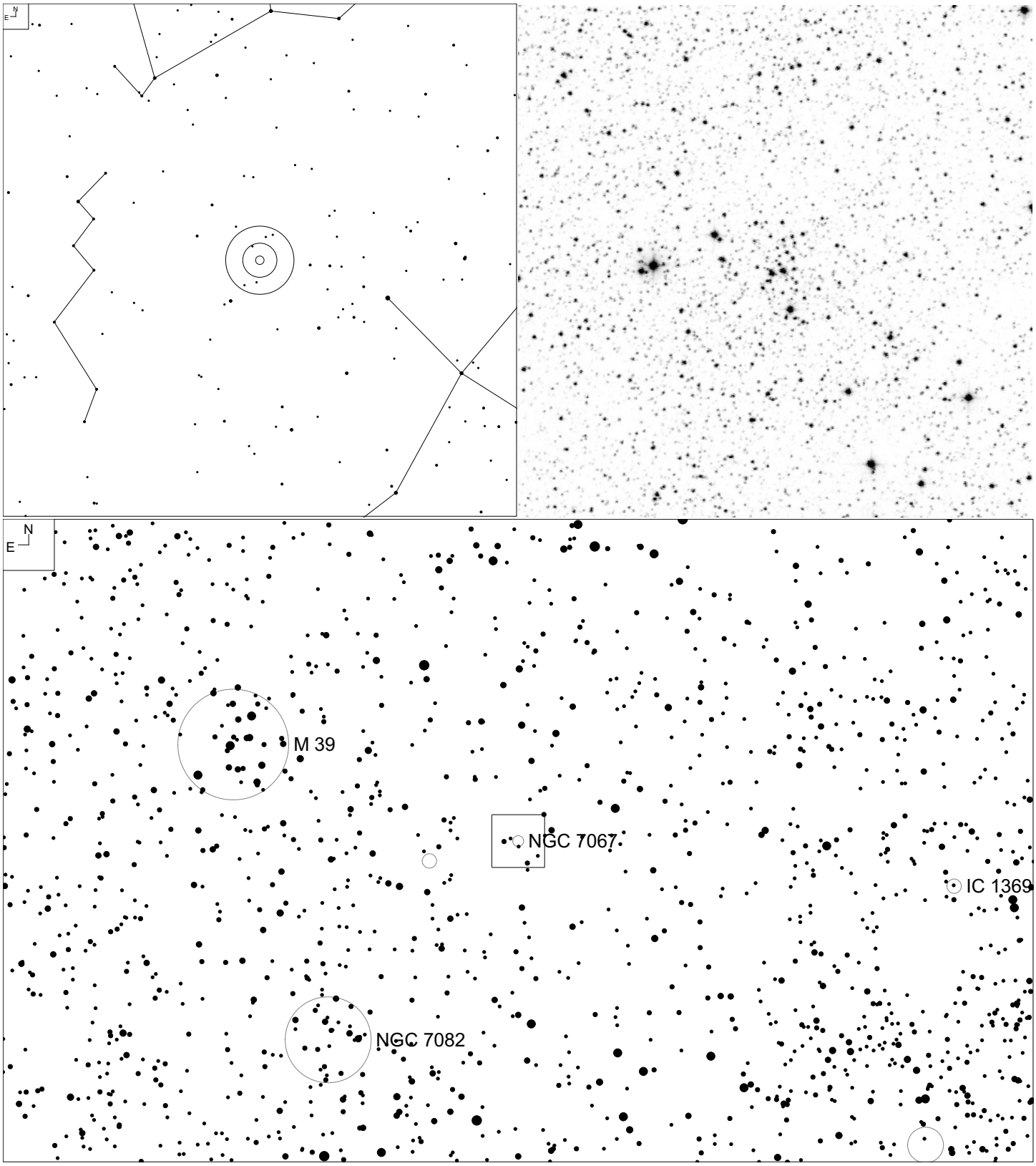
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
IV-13	20 16 24.0	+30 33 51	14.4p	60”	IV + II	48	29

NGC 6905 (Delphinus)



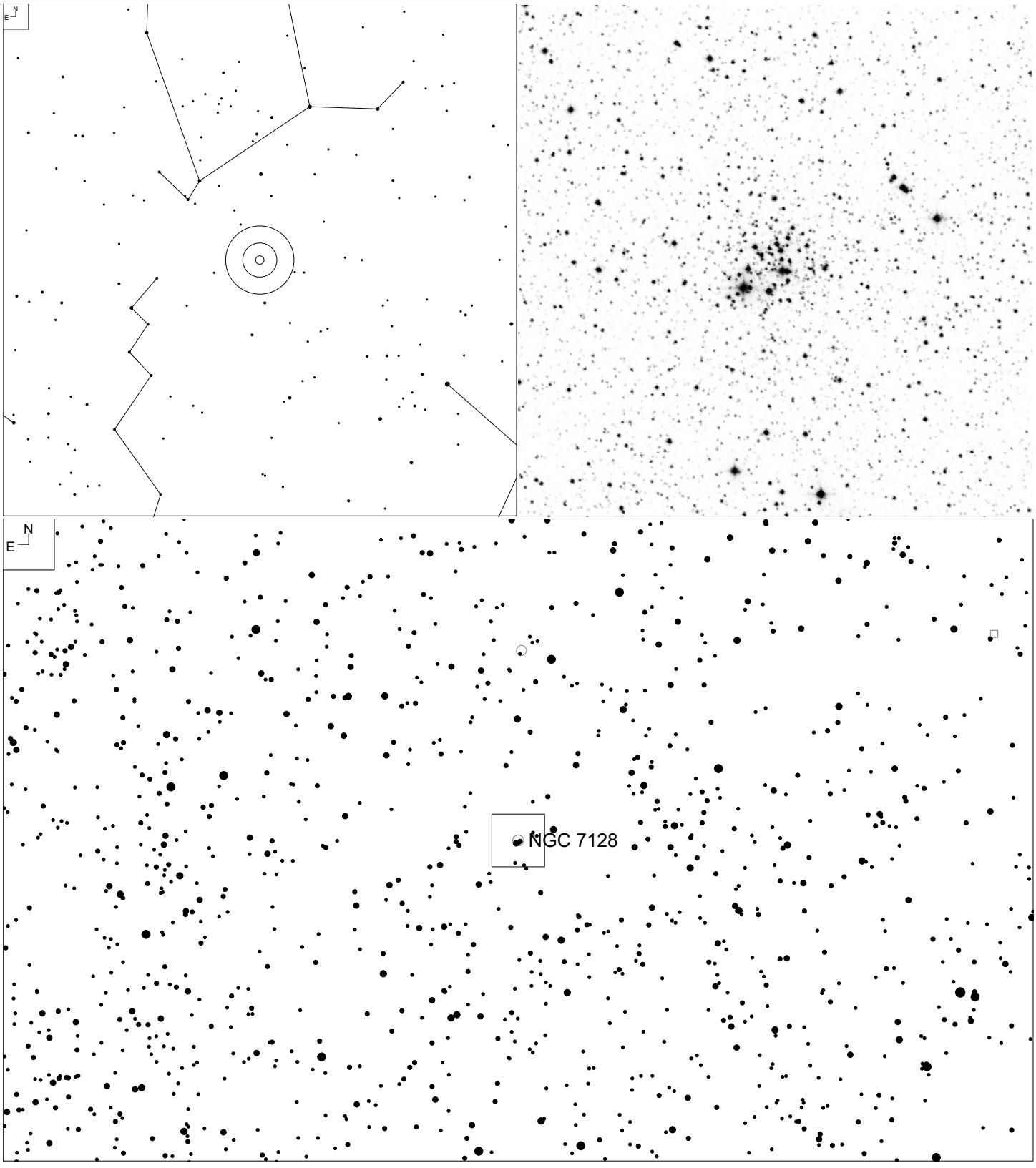
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
IV-16	20 22 23.0	+20 06 16	14.5v	72 x 37”	III + III	66	41

NGC 7067 (Cygnus)



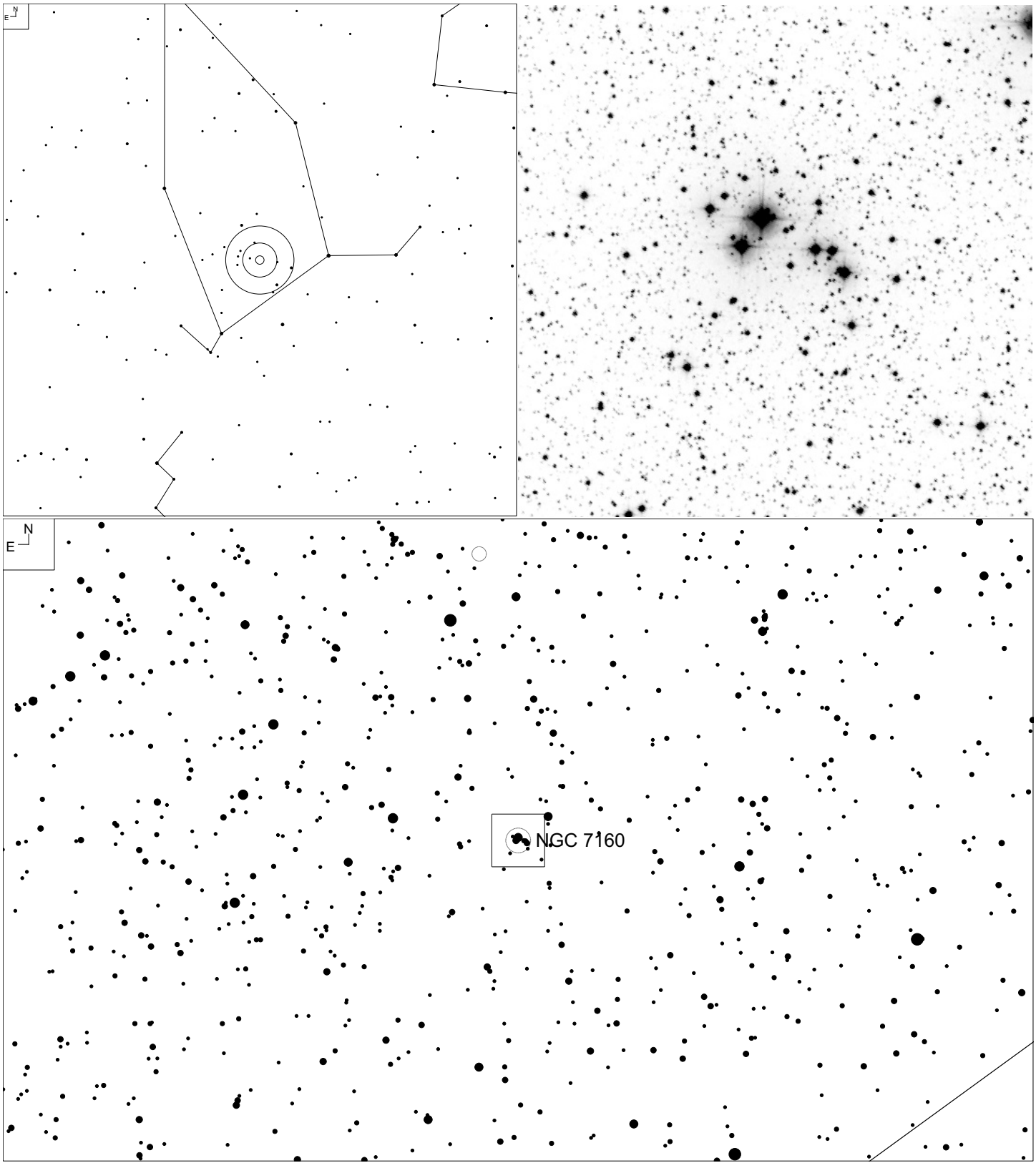
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
VII-50	21 24 12.0	+48 01 00	9.7v	3.0’	II 1 p	32	17

NGC 7128 (Cygnus)



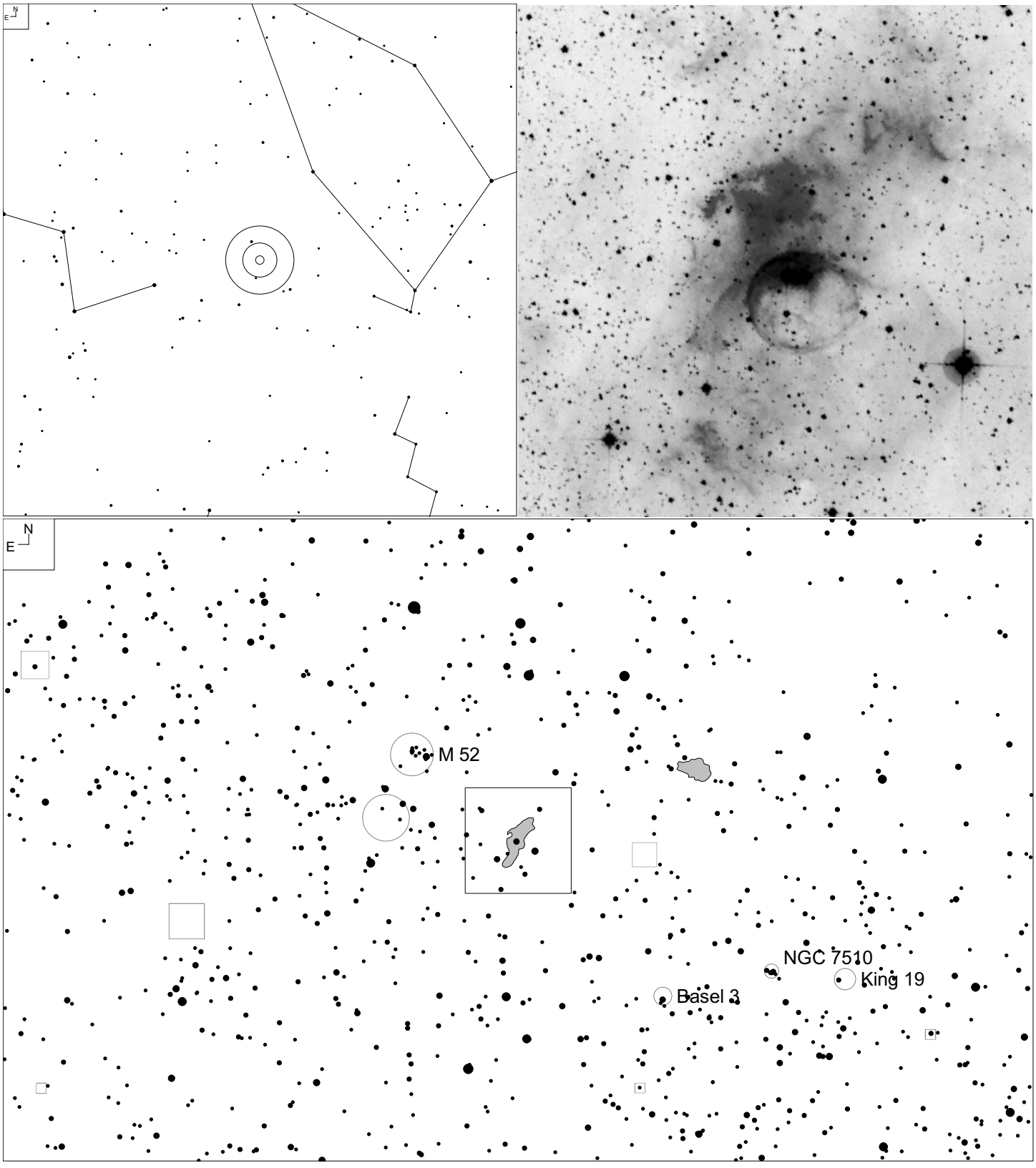
Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
VII-40	21 44 00.0	+53 43 09	9.7v	3.1’	I 3 m	19	8

NGC 7160 (Cepheus)



Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
VIII-67	21 53 48.0	+62 36 00	6.1v	7.0’	I 3 p	19	8

NGC 7635 (Cassiopea)



Herschel	RA	Dec	Mag	Size	Class	Urano 2	iDSA
IV-52	23 20 40.0	+61 12 00	--	16 x 3’	E	18	8