

INTRODUCTION TO ASTRONOMY

Steve Lauritson

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Foreword

The aim of this book is to introduce people to the fascinating world of astronomy. It assumes that the reader has no, or very little understanding of astronomy. As such everything the newcomer needs to begin their study of astronomy is contained within this book. The introduction will give a brief history and background of astronomy as well as some basic information that is necessary to fully understand the information presented in the following pages. This will be kept as brief as possible before plunging straight into observing.

To start with you do not need any equipment to begin your observations. You will be surprised by how much satisfaction you will gain by looking up into the night sky and identifying the constellations and their stars. As your interest grows you might want to get yourself a pair of binoculars or a small telescope. What appears to the unaided eye as an area with just one or two stars can be revealed as a rich star field through binoculars. This book will show you the stars that can be seen with the naked eye as well as objects that can be seen with binoculars.

Rather than starting off with a complete and detailed list of all constellations, this book will start you the most prominent ones. Once you have learned these then you will be able to learn the less prominent ones. These will be covered in the follow up book which will also include details of the planets in our Solar System.

I hope that you find this book interesting at that its study will lead you to a lasting interest in astronomy.

Steve Lauritson

January 2009.

To download the latest version of this book please visit:-

<http://www.astronomybristol.co.uk>

For any comments about this book, requests for better explanations, more information on observing or the inclusion of anything else to do with astronomy then please email me at:

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This book forms part 1 of an Introduction to Astronomy. Part 2 will include the rest of the constellations and a section on the planets.

Acknowledgements

PP3 A celestial chart generation program.

MikTeX A typesetting program to enable production of charts.

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International Meteor Organization for Meteor Information.

International Astronomical Union - Minor Planet Centre for all comet ephemeris.

My Son Ben Lauritson who has checked this book for grammatical and spelling errors and provided constructive criticism from a novice astronomers viewpoint.

My Father 'Laurie' Lauritson and Grandfather George Corbett FRAS without whose help I would have never have had the access to the equipment and knowledge that launched me into the world of Astronomy.

Introduction

Ever since humans first looked to the night skies they have been fascinated by the stars. Ancient humans saw shapes in groups of stars (constellations) and associated them with heroes from their legends. We of the western world have followed the constellations first described by the ancient Greeks. Through their study of the skies the ancient Greeks noticed that some stars did not stay in the same place but moved through the constellations. They called these stars wanderers which in their language was planetai and it is from this that we derive the name planet. The path that the planets and our sun trace through the sky is known as the ecliptic and the constellations that the ecliptic passes through are known as the zodiac. Fortune telling by the positions of the planets within the zodiac is known as astrology and is not discussed by this book.

Johannes Bayer published the first complete star catalogue in 1603. As each star was by then known by many different names, he standardised them in his catalogue by naming each star in a constellation after a letter in the Greek alphabet. Generally the brightest star was designated α Alpha, the first letter in the Greek alphabet, β Beta for the next brightest and so on. Sometimes Bayer designated letters based on position as well as brightness, which means sometimes you will find that order seems incorrect. The complete Greek alphabet is given on the next page.

The brightness of stars is measured in magnitude. Vega in the constellation of Lyra was originally picked to be the reference magnitude of 0.0. Brighter stars such as Sirius have a negative magnitude, Sirius is -1.47. Stars fainter than Vega are positive numbers. The unaided eye can see stars down to a magnitude of 6 in good conditions. With binoculars you can see stars down to magnitude 8. Larger binoculars and small telescopes can see down to magnitude 11. The larger amateur telescopes can see down to magnitude 14 whereas the Hubble Space Telescope can see stars down to magnitude 28.

Because of the vast distances involved between stars, distance is measured in light years. This is the distance a particle of light will travel in one year. Light travels at approximately 186 000 miles per second. In one minute it travels just over 11 million miles. The Earth is 93 million miles from the Sun so light emitted from the surface of the Sun takes just over 8 minutes to reach us here on Earth. In an hour light has travelled almost 700 million miles and in a day it has travelled about 16 billion miles. In a year light has travelled 5 869 713 600 000 miles. The nearest star to the Sun is a star called Proxima Centauri which is just over 4.2 light years away. As you can see it is easier to write 4.2 light years rather than 24 770 191 392 000 miles.

The night sky is like a time machine looking into the past. As you can see from above the light from the sun is 8 minutes old when it reaches us (NEVER look straight at the sun and NEVER try and look at it through binoculars or telescopes). When we look towards the nearest star to the sun we are seeing it as it was just over 4 years ago. 4 light years in the universe is nothing. Some of the easily visible stars are over 2000 light years away so we are seeing them as they were over 2000 years ago. The light from the Andromeda Nebulae which is visible to the unaided eye, left there 2.5 million light years ago. Even this is quite insignificant compared to the furthest objects ever observed with the world's most powerful telescopes which are over 13 billion years old, almost as old as the universe itself.

So, enough of the technical stuff, lets see what is out there.

A Brief Note on Celestial Objects

Double stars and Binaries.

Many stars that look like a single star to the unaided eye are seen to be two or more stars when viewed with binoculars or telescopes.

If the stars are the same distance away and part of a system where their orbits share a common centre of gravity then they are known as Binary stars. If they appear to be together but lie at different distances, only seeming to be together because of line of sight, they are known as optical double stars.

Star Clusters.

There are two types of star cluster, an open cluster and a globular cluster.

An open cluster can consist of a few hundred to a few thousand stars. They are relatively young stars that have formed from the same gas cloud. In some cases the remains of the gas cloud can be seen in nebulosity surrounding the stars. The Pleiades in Taurus have to be the best known example of an open cluster.

A globular cluster is a spherical cluster of many thousands of stars with a dense core of stars. All the stars in a globular cluster are very old and are thought to consist of some of the first stars that formed in a galaxy.

Nebulae

A nebula is a cloud of interstellar gas or dust. Nebulae can be regions where new stars are forming. Before galaxies were actually discovered, the ones that had already been observed were called nebulae and the name sticks today. So a nebula is a gas cloud within our own galaxy or other galaxies outside ours.

The Greek alphabet.

α Alpha, β Beta, γ Gamma, δ Delta, ϵ Epsilon, ζ Zeta, η Eta, θ Theta, ι Iota, κ Kappa, λ Lambda, μ Mu, ν Nu, ξ Xi, \omicron Omicron, π Pi, ρ Rho, σ Sigma, τ Tau, υ Upsilon, ϕ Phi, χ Chi, ψ Psi, ω Omega.

Notes on the information about the constellations.

Where possible I've tried to put a name to the star along with its Bayer identifier. The distances of the stars have been taken from the Hipparcos Catalogue that was created by the Hipparcos Space Astrometry Mission that measured over one hundred thousand stars with high precision. Even so there is still a calculated margin of error that varies from star to star. As to the brightness of the stars compared to our sun, I have found wildly varying estimates from star to star and in each case have entered the best result from the data that I have. As this is an introduction to astronomy and there will be a lot of unaided eye observations I have rounded up the magnitudes of stars to two significant digits.

Notes on observing.

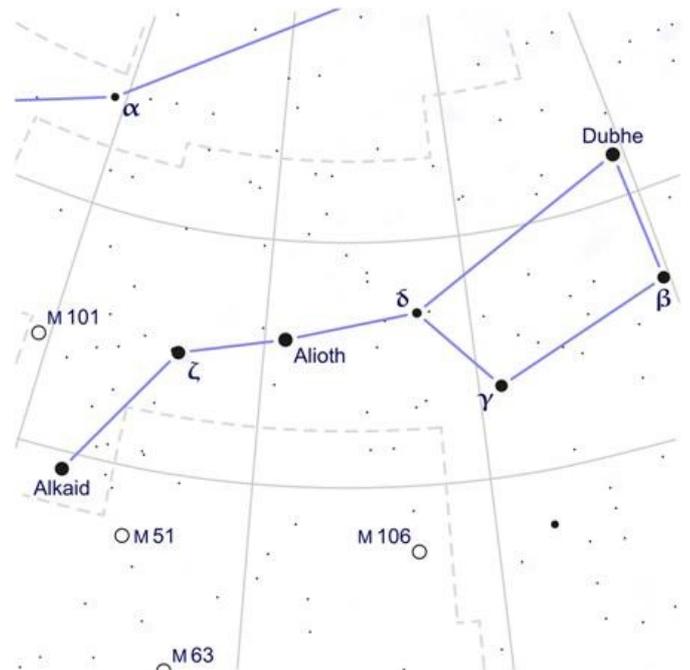
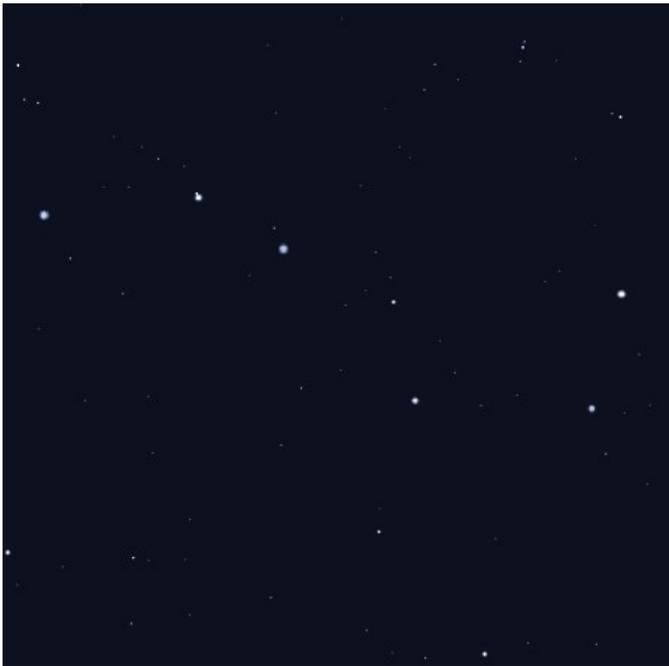
Learn the constellations one at a time. Study the diagrams on the constellation page and then check with the monthly chart to make sure that the constellation you want to observe will be visible on that night. If necessary refer to the star charts at the back of the book to see how the constellation you are studying fits in with the others on the sky. Once you are happy that you can recognise the constellation without having to refer to the chart then you can move on to the next one. There is nothing to stop you looking around the whole sky, in fact I would encourage it. You will observe something, want to know what it is, and then study the charts to find out what it was. That sort of knowledge always sticks. Learning the constellations is essential to finding your way around the sky. So if you mix the two, learn a constellation and then have a general look around, you will be surprised how quickly you learn.

When you want to observe faint objects you will have to make sure that the moon is not in the sky at the same time. A full moon can blot out even relatively bright objects when it is close to them.

Binoculars that are good for day viewing such as 8x21 are not recommended as they do not collect enough light for astronomical use although they can still be used to good effect. Ideally you need binoculars with objective lenses of at least 50mm eg 10x50. 10 times magnification is about the highest magnification you can use hand held. Anything higher and you will need a tripod to keep the image steady.

URSA MAJOR

The Great Bear, also known as the Plough – Star Atlas Chart 1



Ursa Major is one of the best recognised constellations in the sky. From the UK it is visible all year round. If you face towards the north then in the autumn it is low in the sky while in the springtime it is high in the sky almost over head. It is a large constellation but is most recognisable from its seven major stars shown here. α UMa Dubhe is a yellowish star of magnitude 1.8. It is 232 times brighter than the sun and is 124 light years away.

β UMa Merak is a blue-white star of magnitude 2.3. It is 60 times brighter than the sun and is 79 light years away.

γ UMa Phad is a blue-white star of magnitude 2.4. It is 60 times brighter than the sun and is 84 light years away.

δ UMa Megrez is a blue-white star of magnitude 3.3. It is 25 times brighter than the sun and is 81 light years away.

ϵ UMa Alioth is a blue-white star of magnitude 1.8. It is 104 times the brightness of the sun and is 81 light years away.

ζ UMa Mizar is probably the most famous double star in the sky. It has a companion Alcor that is just visible to the unaided eye. When viewed through binoculars another star is visible between Mizar and Alcor. Through a small telescope Mizar itself is seen to be a double star. Not visible through a small telescope is that both stars that make up Mizar are both themselves double stars but you need a very large telescope to resolve them.

η Alkaid is a blue star of magnitude 1.8. It is 148 times brighter than the sun and is 100 light years away.

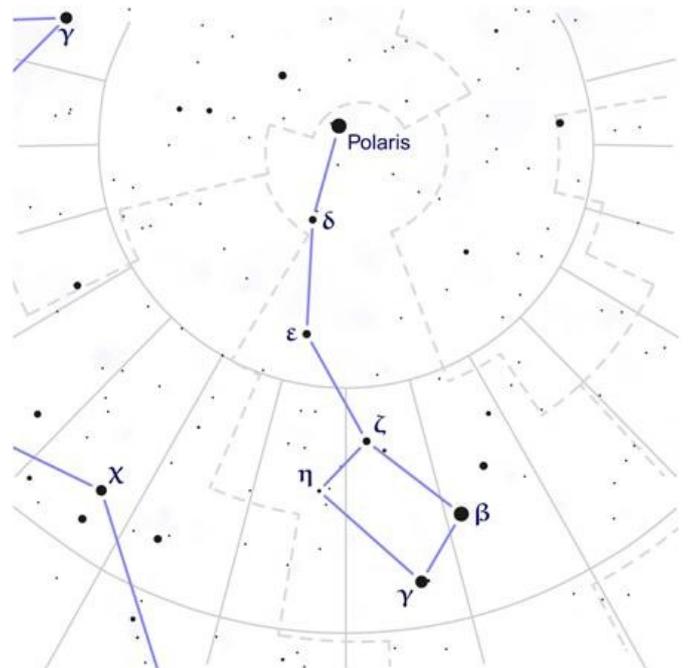
Dubhe and Merak are known as the pointer stars. If you draw a line from Merak and extend it through Dubhe, it points towards the pole star – Polaris.

Myth.

The Great Bear represents Callisto, daughter of King Lacaon. Callisto hunted with Artemis Goddess of the hunt and became her favourite. Once when visiting the Earth Zeus the Head of the Gods saw Callisto asleep in the forest. Zeus had his way with her and she became pregnant. Callisto gave birth to a son Arcas. Hera the wife of Zeus was furious and changed Callisto into a bear. Arcas grew up to be a hunter himself. One day on a hunt he saw Callisto but did not recognise her in her shape as a bear and he went in for the kill. Zeus stopped him slaying his mother by sending down a whirlwind which took both Callisto and Arcas into the sky where they were placed as stars, Callisto as the Great Bear and Arcas as the Little Bear.

URSA MINOR

The Little Bear – Star Atlas Chart 1



Ursa Minor is a faint constellation with only 3 of its stars being relatively bright. Its brightest star is Polaris which is known as the Pole star or North star, so called because it is always above the North Pole. Apart from this there are no real interesting objects in the constellation.

α UMi Polaris is a white star of magnitude 1.97. It is 2400 times brighter than the sun and is 431 light years away.

β UMi Kocab is an orange star of magnitude 2.0. It is 190 times brighter than the sun and is 126 light years away.

γ UMi Pherkad Major is a blue-white star of magnitude 3.0. It is 1200 times brighter than the sun and is 480 light years away.

δ UMi Yildun is a blue-white star of magnitude 4.3. It is 50 times brighter than the sun and is 183 light years away.

ϵ UMi is a yellowish star of magnitude 4.2. It is 200 times brighter than the sun and is 347 light years away.

ζ UMi Alifa is a blue-white star of magnitude 4.3. It is 220 times brighter than the sun and is 375 light years away.

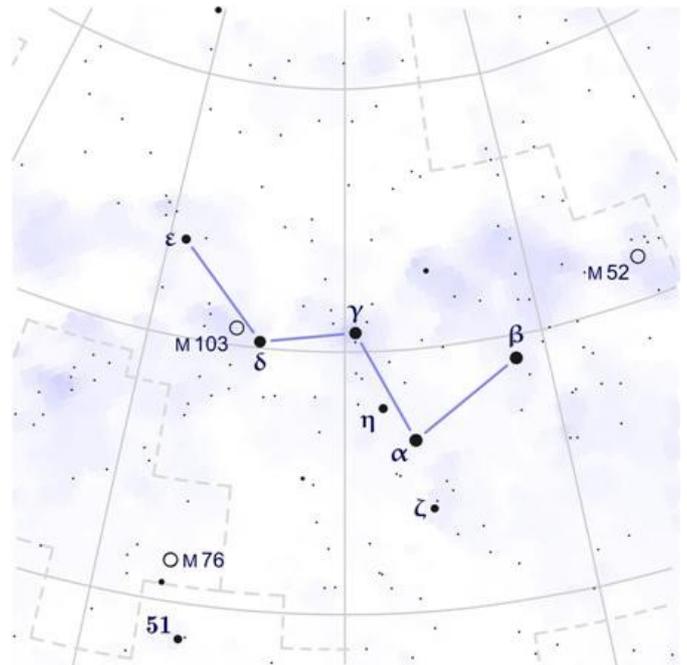
η UMi Alasco is a white star of magnitude 4.9. It is 8 times brighter than the sun and is 97 light years away.

Myth.

The Little Bear is Arcas, son of Callisto.

CASSIOPEIA

The Queen – Star Atlas Chart 1



Cassiopeia is one of the most easily recognisable of the constellations in the northern sky. Standing out as a giant W Cassiopeia lies within the Milky Way and has many wonderful objects.

α Cas Schedir is an orange star of magnitude 2.2. It is 534 times brighter than the sun and is 229 light years away.

β Cas Caph is a yellowish star of magnitude 2.3. It is 29 times brighter than the sun and is 55 light years away.

γ Cas Tsih is a blue star of magnitude 2.2. It is 4180 times brighter than the sun and is 613 light years away.

δ Cas Ruchbah is a blue-white star of magnitude 2.7. It is 69 times brighter than the sun and is 99 light years away.

ε Cas Segin is a blue star of magnitude 3.4. It is 720 times brighter than the sun and is 442 light years away.

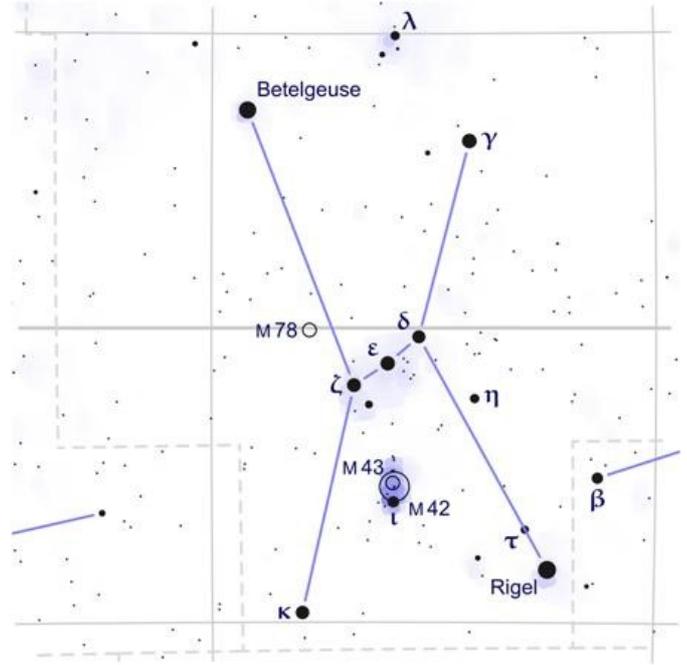
η Cas Achrid is a star of magnitude 3.4 and is 20 light years away.

Myth.

Cassiopeia was the vain Queen of King Cephus. She boasted that she was more beautiful than the Nereids, the daughters of the God Nereus, the old man of the sea. One of the Nereids was the wife of Poseidon, God of the sea. She begged him to punish Cassiopeia because of her boasts. Poseidon sent Cetus the sea monster to attack the lands of Cephus and Cassiopeia. Cephus had to offer his daughter Andromeda as a sacrifice to appease the monster. Andromeda was chained to a rock but was rescued by Perseus who killed Cetus. Cassiopeia was set in the sky. She is depicted as sat on a chair and suffers the indignity of spending half her time upside down as she circles the celestial pole.

ORION

The Hunter – Star Atlas Chart 3



For me Orion has to be the most spectacular constellation in the night sky. It is easily the most recognisable of all the constellations and is full of interesting objects.

α Ori Betelgeuse is a variable red giant star of magnitudes between 1.3 and 0.4 . It is 10,000 times brighter than the sun and is 427 light years away. It has a diameter of 650 times that of our sun and if it was put in place of our sun it would encompass the orbits of Mercury, Venus, our Earth, Mars and out as far as the asteroid belt. It is easily seen as a red star.

β Ori Rigel is a blue supergiant star of magnitude 0.2. It is 40,000 times brighter than the sun and is 770 light years away. It is the brightest star in Orion and the 6th brightest star in the sky. It is a double star with its companion a 7th magnitude star. However because of the brightness of Rigel it is only visible through telescopes with objective lenses or mirrors greater than 6 inches.

γ Ori Bellatrix is a blue giant star of magnitude 1.6. It is 1000 times brighter than the sun and is 243 light years away. It is the 3rd brightest star in Orion.

δ Ori Mintaka, ε Ori Alnilam and ζ Ori Alnitak make up the famous 'Belt' of Orion. All 3 stars are binary stars. Mintaka is a blue giant of magnitude 2.3. It is 3000 times brighter than the sun and is 920 light years away. Alnilam is a blue supergiant star of magnitude 1.7. It is 250,000 times brighter than the sun and is 1340 light years away. Alnitak is a blue supergiant star of magnitude 1.7. It is 11,000 times brighter than the sun and is 820 light years away.

Hanging down from the belt is the 'Sword' of Orion. It is made up of what looks like 3 stars to the unaided eye but is in fact stars and nebulae. ι Ori Nair al Saif is a blue star of magnitude 2.8. It is 11,200 times brighter than the sun and is 1326 light years away. Above it is θ Ori which part of 4 stars known as the Trapezium which illuminates the famous Orion nebula. This is a fantastic region to look at through binoculars and telescopes and is one of the most studied parts of the sky.

κ Ori Saiph is a blue supergiant star of magnitude 2.1. It is 6000 times brighter than the sun and is 720 light years away.

Myth.

Orion was a famous hunter who was killed when he stood on a scorpion. As a result the gods put him in the sky with his two hunting dogs Canis Major and Canis Minor. The scorpion was put in the opposite part of the sky so the two will never meet again.

CANIS MAJOR

The Great Dog – Star Atlas Chart 3



Canis Major is a small constellation with a few bright stars. It is most famous for its brightest star, Sirius the dog star.

α CMa Sirius is a white star of magnitude -1.5. It is 22 times brighter than the sun and is 8.6 light years away. It is the brightest star in the night sky. It is a double star with its companion known as the pup.

β CMa Mirzam is a blue star of magnitude 2. It is 3250 times brighter than the sun and is 499 light years away.
γ CMa Muliphein is a blue star of magnitude 4.1. It is 295 times brighter than the sun and is 295 light years away.

δ CMa Wezen is a yellowish supergiant star of magnitude 1.8. It is 47,900 times brighter than the sun and is 1790 light years away.

ε CMa Adara is a blue star of magnitude 1.5. It is 3750 times brighter than the sun and is 431 light years away.

ζ CMa Furud is a blue star of magnitude 3. It is 560 times brighter than the sun and is 336 light years away.

η CMa Aludra is a blue supergiant star of magnitude 2.5. It is 100,000 times brighter than the sun and is 3200 light years away.

NGC 2362 is a cluster of 40 - 60 stars surrounding τ CMa and is easily seen with binoculars. τ CMa is of magnitude 4.4 and is thought to be a part of the cluster. It is estimated to be 5000 light years away a brightness of 50,000 times that of the sun.

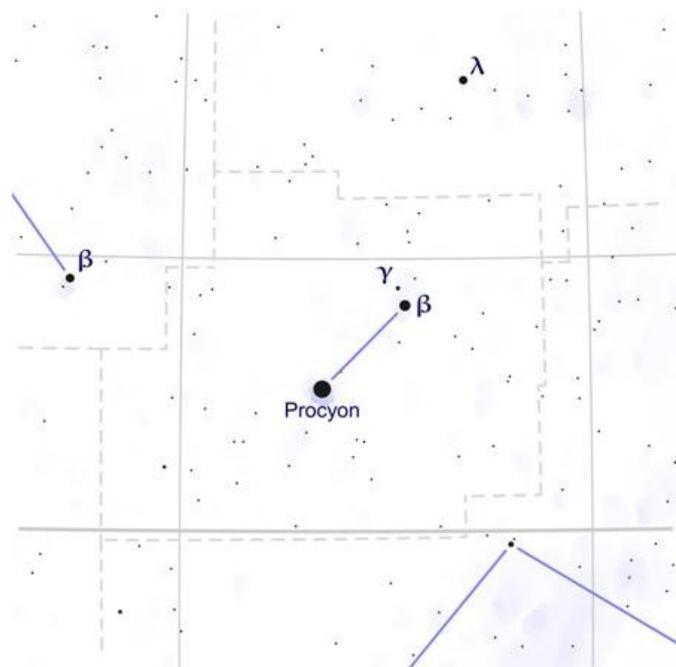
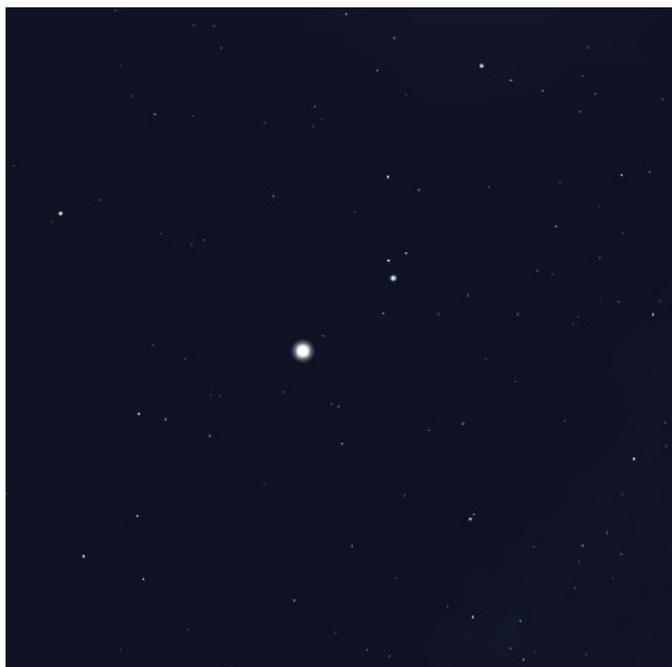
M 41 is a large cluster which is easily seen with binoculars. If the viewing conditions are excellent then it is possible to discern the cluster with the unaided eye.

Myth.

Canis Major is one of Orion's hunting dogs.

CANIS MINOR

The Little Dog – Star Atlas Chart 3



Canis Minor is a small constellation that contains only two bright stars.

α CMi is a yellowish star of magnitude 0.4. It is 7 times brighter than the sun and is 11.4 light years away. It is a binary star with its companion being of 10th magnitude.

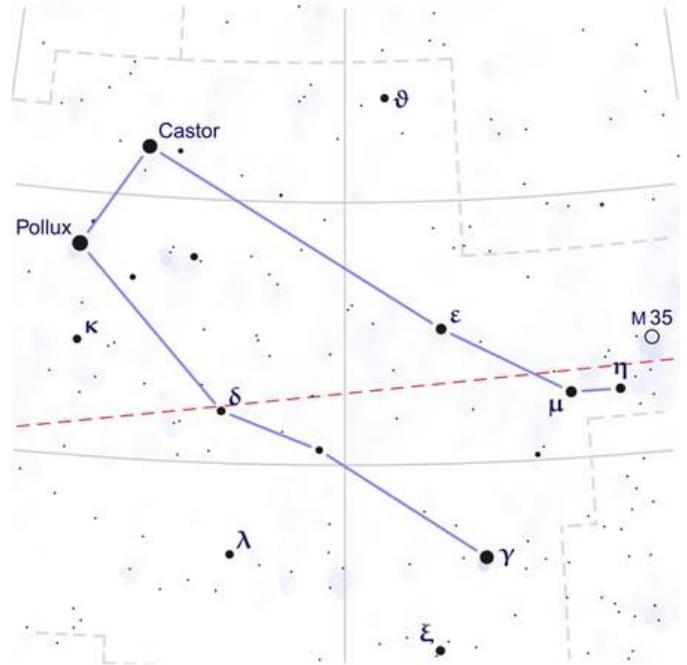
β CMi Gomeisa is a blue-white star of magnitude 2.9. It is 163 times brighter than the sun and is 170 light years away.

γ CMi is an orange star of magnitude 4.3. It is 236 times brighter than the sun and is 398 light years away.

There are no other notable objects in Canis Minor.

GEMINI

The Twins – Star Atlas Chart 3



Gemini is the third constellation of the Zodiac and is best known for its two brightest stars Castor and Pollux.

α Gem Castor is a white star of magnitude 1.6. It is 50 times brighter than the sun and is 52 light years away. It is a triple system. Unfortunately a good telescope is required to see the 3 stars.

β Gem Pollux is a red giant star of magnitude 1.2. It is 30 times brighter than the sun and is 34 light years away.

γ Gem Alhena is a white star of magnitude 1.9. It is 150 times brighter than the sun and is 105 light years away.

δ Gem Wasat is a white star of magnitude 3.5. It is 11 times brighter than the sun and is 59 light years away.

ε Gem Mabsuta is a blue-white star of magnitude 3. It is 3900 times brighter than the sun and is 903 light years away.

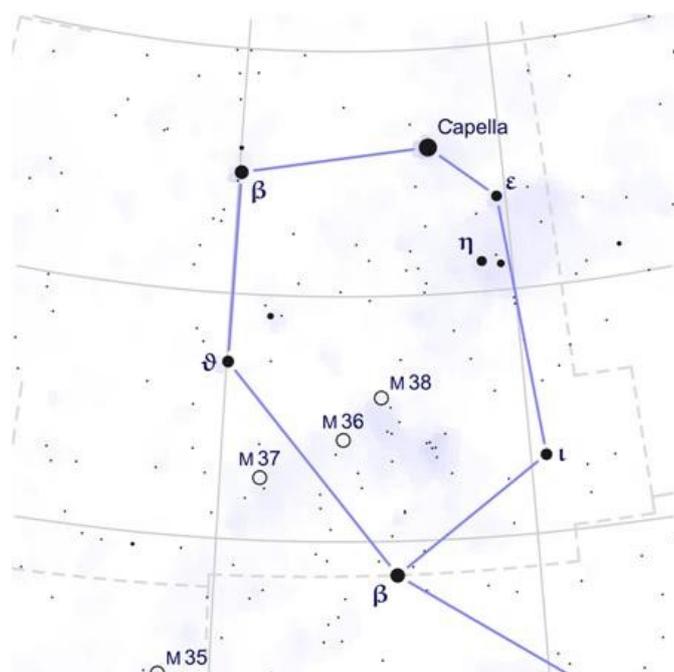
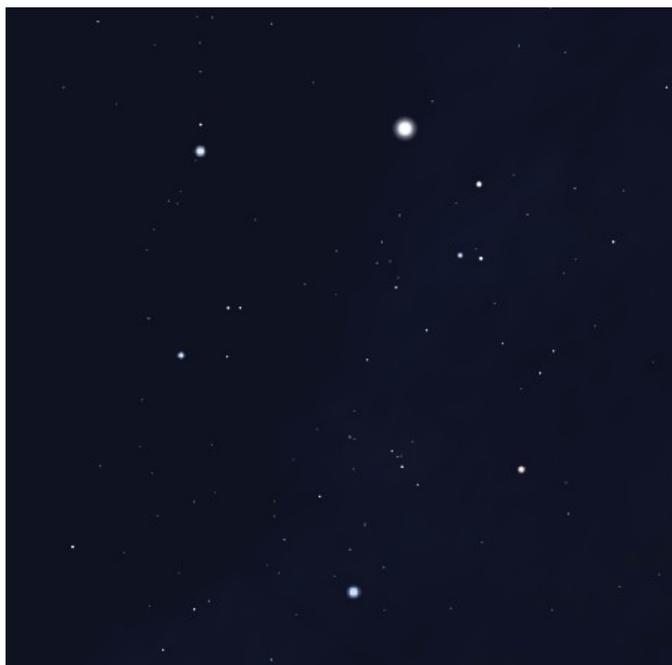
M 35 is a cluster of about 200 stars. When viewed through binoculars or small telescopes the cluster is visible as a hazy patch.

Myth.

Castor and Pollux were identical twins. Their mother Queen Leda was seduced by Zeus. Castor was born mortal while Pollux was immortal. Both were hunters and skilled in the art of war. They accompanied Jason and the argonauts on the search for the golden fleece. Castor was killed in a fight with another pair of twins Idas and Lynceus. Lynceus killed Castor, Pollux killed Lynceus. As Idas was about to attack Pollux, Zeus intervened and killed Idas. Pollux was inconsolable at the death of his brother and begged Zeus that he could share his immortality with his brother. Zeus placed them together in the stars as Gemini.

AURIGA

The Charioteer – Star Atlas Chart 3



Auriga is a fairly large constellation with many interesting objects.

α Aur Capella is a yellowish giant star of magnitude 0.1. It is 80 times brighter than the sun and is 42 light years away.

β Aur Menkalinan is a white star of magnitude 1.9. It is 95 times brighter than the sun and is 82 light years away.

δ Aur Prijipati is a orange star of magnitude 3.7. It is 51 times brighter than the sun and is 140 light years away.

ϵ Aur Maaz is a white star of magnitude 3. It is 20,600 times brighter than the sun and is 2040 light years away.

η Aur is a blue star of magnitude 3.2. It is 206 times brighter than the sun and is 219 light years away.

θ Aur is a blue-white star of magnitude 2.6. It is 210 times brighter than the sun and is 173 light years away.

ι Aur Kabdhilinan is an orange star of magnitude 2.7. It is 1770 times brighter than the sun and is 512 light years away.

There is no γ Aur as it is shared with Taurus and is listed as β Tau.

There are 3 good open clusters that are visible with binoculars in Auriga.

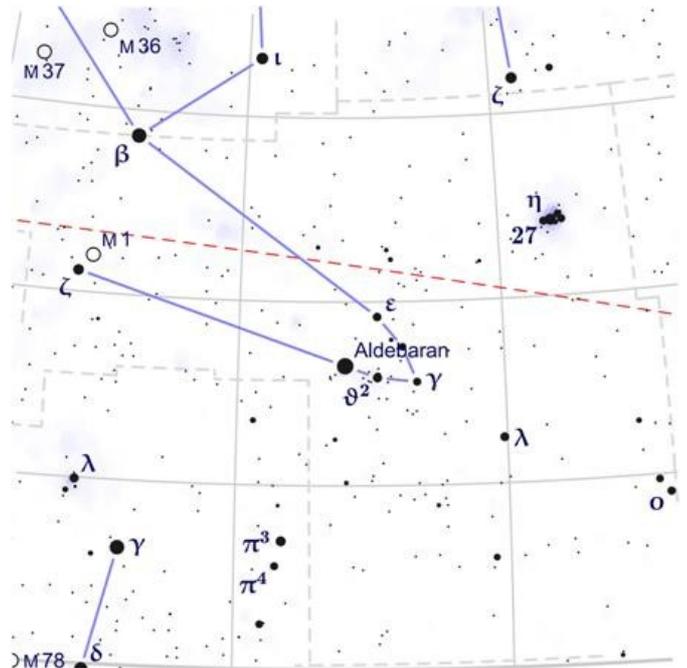
M 36 consists of 60 stars. It is 41,000 light years away. M 37 is the brightest of the clusters and estimates of its distance range from 4,100 – 4,700 light years. M38 is 4,200 light years away.

Myth.

There are many legends about the charioteer but we will recount the Greek one. King Erichthonius was the son of Hephaestus the God of fire. Like his father Erichthonius was lame. He was raised by Athene patron Goddess of Athens. She taught him how to tame horses. It was Erichthonius who first harnessed 4 horses to a chariot to imitate the Sun Chariot of Apollo the God of the Sun. He was honoured by Zeus by being placed in the stars as Auriga.

TAURUS

The Bull – Star Atlas Chart 3



Taurus is the second sign of the Zodiac.

α Tau Aldebaran is a red giant star of magnitude 0.9. It is 200 times brighter than the sun and is 65 light years away. Aldebaran represents the glowing eye of the bull.

β Tau Alnath is a blue star of magnitude 1.7. It is 302 times brighter than the sun and is 131 light years away.

γ Tau is a yellowish star of magnitude 3.6. It is 67 times brighter than the sun and is 154 light years away.

δ Tau is a wide double consisting of $\delta 1$ a yellow-white star of magnitude 3.8 and $\delta 2$ a blue-white star of magnitude 4.8. $\delta 1$ is 59 times brighter than the sun and is 153 light years away while $\delta 2$ is 20 times the brightness of the sun and is 146 light years away.

ϵ Tau Ain is an orange star of magnitude 3.5. It is 75 times brighter than the sun and is 155 light years away.

ζ Tau is a blue star of magnitude 3. It is 900 times brighter than the sun and is 417 light years away.

θ Tau is a yellow star of magnitude 3.8. It is 58 times brighter than the sun and is 158 light years away. It is a binary star that is easily seen in binoculars and also with the unaided eye when viewing conditions are very good. Its companion is a blue-white star of magnitude 3.4. It is 87 times the brightness of the sun and is 158 light years away.

The Pleiades are the most famous object in Taurus. Also known as the Seven Sisters they are an open cluster of which 6 stars can easily be seen with the unaided eye. Through binoculars or a telescope the view is spectacular with the faint nebulosity clearly seen as well as many more stars.

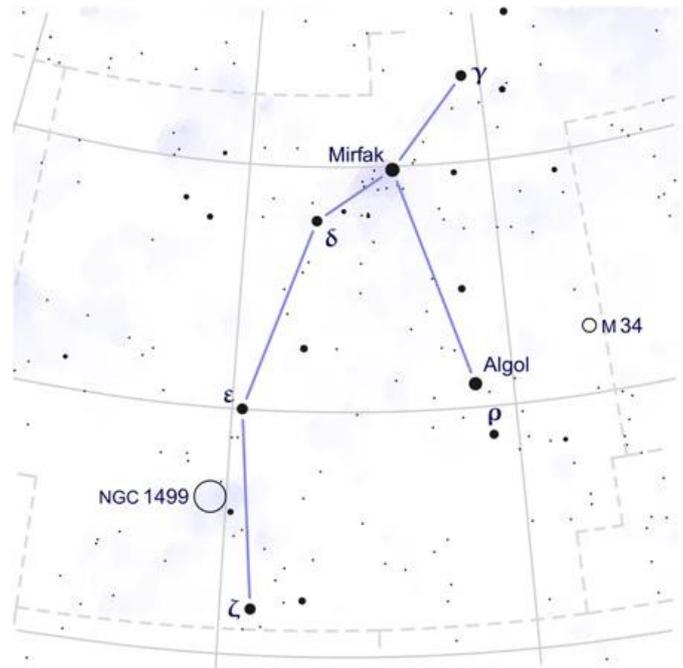
The Hyades is the nearest open cluster to us. On a clear night they are a rich star field around Aldebaran. While Aldebaran seems to be part of the Hyades it is not associated with them, it just happens to be in the line of sight. Through binoculars the view is just as spectacular with many more stars revealed.

Myth.

Taurus represents Zeus as the Bull was one of the disguises he used to appear to mortals.

PERSEUS

The Hero – Star Atlas Chart 2



Perseus is a fairly large constellation between Auriga and Andromeda.

α Per Mirphak is a white star of magnitude 1.8. It is 5400 times brighter than the sun and is 592 light years away.

β Per Algol is a blue star of magnitude 2.1. It is 100 times brighter than the sun and is 93 light years away. It is a famous variable star that varies by a magnitude of 1.3. The variation is caused by Algol being an eclipsing binary. The companion star passes in front of Algol every 2 days and 21 hours causing it to dim to magnitude 3.4

γ Per is a yellow star of magnitude 2.9 and is 221 light years away.

δ Per is a blue star of magnitude 3. It is 1400 times brighter than the sun and is 527 light years away.

ϵ Per Miram is a blue star of magnitude 2.9. It is 1600 times brighter than the sun and is 538 light years away. It lies in a rich star field which makes an interesting object with binoculars and telescopes.

ζ Per Menkib is a blue star of magnitude 4. It is 6480 times brighter than the sun and is 1770 light years away.

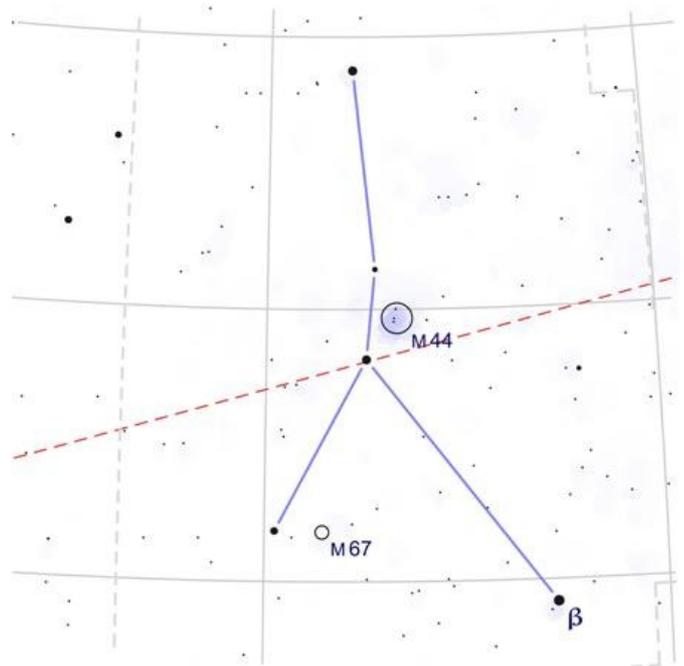
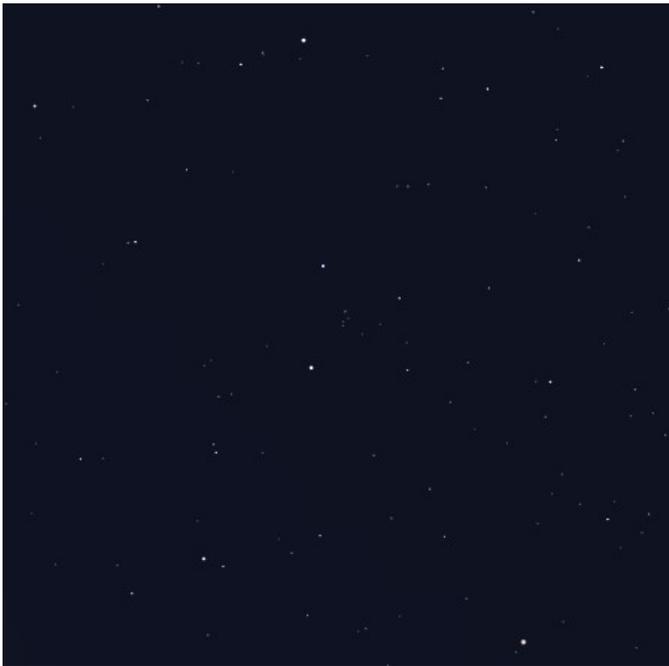
M 34 is an open cluster. It can be seen as a nebulous patch by the unaided eye and can be resolved as single stars with binoculars.

Myth.

Perseus was the son of Zeus and Danae, daughter of King Arcisius. He was raised by Dictys brother of King Polydectes. The King desired Perseus's mother but Perseus prevented this. Polydectes decided to get rid of Perseus. He announced his marriage to Hippodameia and demanded that Perseus bring him the head of Medusa as a wedding gift. The King thought that Medusa would kill Perseus. Perseus had friends amongst the gods. Hades, God of the underworld gave him a helmet to make him invisible. Hermes the messenger gave him winged sandals to fly through the air. Hephaestus, God of fire and the forge gave him a sword of diamond. Athena gave him a polished bronze shield that he could use as a mirror so that he did not have to look at Medusa directly and so avoid being turned to stone. Perseus fought Medusa and cut off her head. Out of her body came Pegasus the winged horse. Perseus rode Pegasus back to King Polydectes but on the way saw Andromeda chained to a rock with Cetus about to kill her. Perseus killed Cetus and freed Andromeda. He claimed Andromeda for his wife. After they were married Perseus returned to King Polydectes who was angry with Perseus for succeeding. Perseus showed him Medusa's head thereby turning the king to stone.

CANCER

The Crab – Star Atlas Chart 4



Cancer is the 4th sign of the Zodiac. It is quite a faint constellation but does contain a couple of interesting objects.

α Cnc Acubens is a blue-white star of magnitude 4.3. It is 48 times brighter than the sun and is 174 light years away.

β Cnc Altarf is an orange star of magnitude 3.5. It is 263 times brighter than the sun and is 290 light years away.

γ Cnc is a blue-white star of magnitude 4.7. It is 28 times brighter than the sun and is 158 light years away.

δ Cnc is an orange star of magnitude 4. It is 40 times brighter than the sun and is 136 light years away.

ι Cnc is a yellowish star of magnitude 4. It is 70 times brighter than the sun and is 188 light years away. It is a double star with a companion of 7th magnitude and should be visible through binoculars.

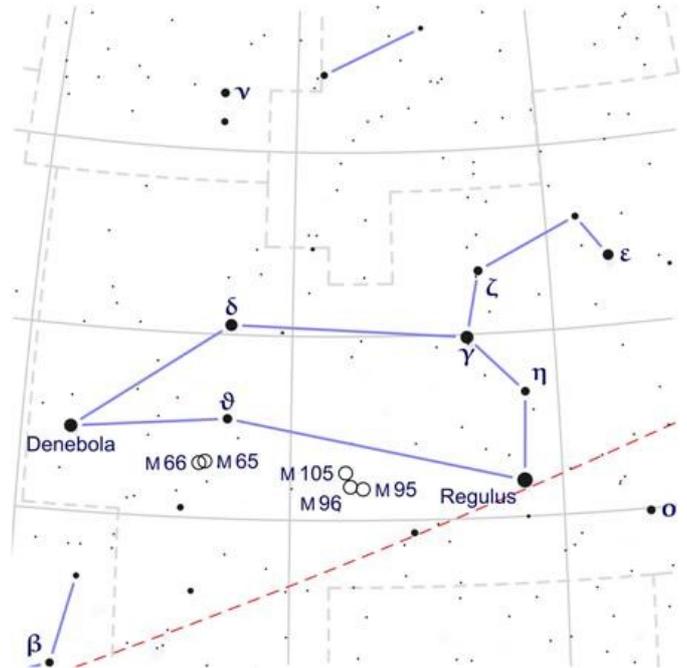
M 34 Praesepe, also known as the Beehive cluster is visible to the unaided eye as a faint nebulous patch. It is quite a large cluster and is best viewed through binoculars.

Myth.

Hera wife of Zeus was angry with Hercules. One of his labours was to defeat the Hydra of Lerna. While he was doing battle with the Hydra, Hera sent a crab to distract him. However Hercules stepped backwards and crushed the crab. Hera put the crab in the stars as Cancer as a reward for its efforts.

LEO

The Lion – Star Atlas Chart 4



Leo is the 5th sign of the Zodiac and is best recognised by the stars that form a shape of a sickle.

α Leo Regulus is a blue star of magnitude 1.4. It is 140 times brighter than the sun and is 78 light years away. It is a double star with an 8th magnitude companion that can be seen with binoculars.

β Leo Denebola is a blue-white star of magnitude 2.1. It is 15 times brighter than the sun and is 36 light years away.

γ Leo Algeiba is an orange star of magnitude 2. It is 199 times brighter than the sun and is 126 light years away. It is a binary star with a companion of magnitude 3.8 that is visible with binoculars.

δ Leo Duhr is a blue-white star of magnitude 2.6. It is 25 times brighter than the sun and is 58 light years away. The Greek name for this star is Zosma but it was translated from the wrong word so the Arabic Duhr is used which means The Lion's Back.

ϵ Leo Ras Elased australis is a yellow star of magnitude 3. It is 328 times brighter than the sun and is 251 light years away.

ζ Leo Adhafera is a white star of magnitude 3.4. It is 34 times brighter than the sun and is 99 light years away. It is a triple star but is visible as a double through binoculars.

η Leo is a blue-white star of magnitude 3.5. It is 14,800 times brighter than the sun and is 2130 light years away.

θ Leo Chertan is a blue-white star of magnitude 3.3. It is 118 times brighter than the sun and is 178 light years away.

μ Leo Rasalas is an orange star of magnitude 3.9. It is 40 times brighter than the sun and is 133 light years away.

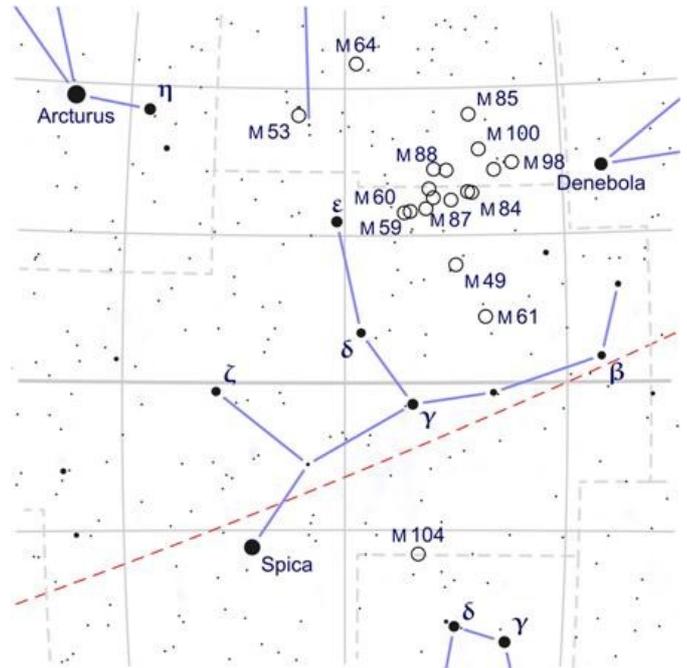
There are many nebulae in the constellation of Leo but unfortunately they are not visible with binoculars.

Myth.

Legend says that there was a lion that terrorised a town of Nemea south west of Corinth. He had a hide that could not be pierced by any weapon. Hercules was given the task of killing this lion as the first of his twelve labours. Hercules fought with the lion for a whole month before he was able to strangle it. Once it was dead he used its own claws to cut off its hide. He then used the hide as armour and its head as a helmet. This is the lion that was put into the stars as Leo.

VIRGO

The Virgin – Star Atlas Chart 5



Virgo is the 6th sign of the zodiac. It is famous for the Virgo galaxy cluster but unfortunately most of these can only be seen with a reasonably powerful telescope.

α Vir Spica is a blue giant star of magnitude 0.98. It is 2200 times brighter than the sun and is 262 light years away. Because Spica is the 16th brightest star in the night sky and it is in a fairly barren region of the sky, it stands out very prominently.

β Vir Zavijava is a white star of magnitude 3.6. It is 4 times brighter than the sun and is 36 light years away.

γ Vir Porrima is a white star of magnitude 2.9. It is 39 light years away.

δ Vir Minelauva is a red star of magnitude 3.4. It is 146 times brighter than the sun and is 202 light years away.

ϵ Vir Vindemiatrix is a yellow star of magnitude 2.9. It is 60 times brighter than the sun and is 102 light years away.

ζ Vir Heze is a blue-white star of magnitude 3.4. It is 19 times brighter than the sun and is 73 light years away.

θ Vir is a blue-white star of magnitude 4.4. It is 245 times brighter than the sun and is 415 light years away.

ν Vir is a red star of magnitude 4. It is 191 times brighter than the sun and is 313 light years away.

Myth.

There are various stories concerning Virgo.

One is that she is Dike, the Goddess of Justice, hence she is next to Libra, the scales of justice.

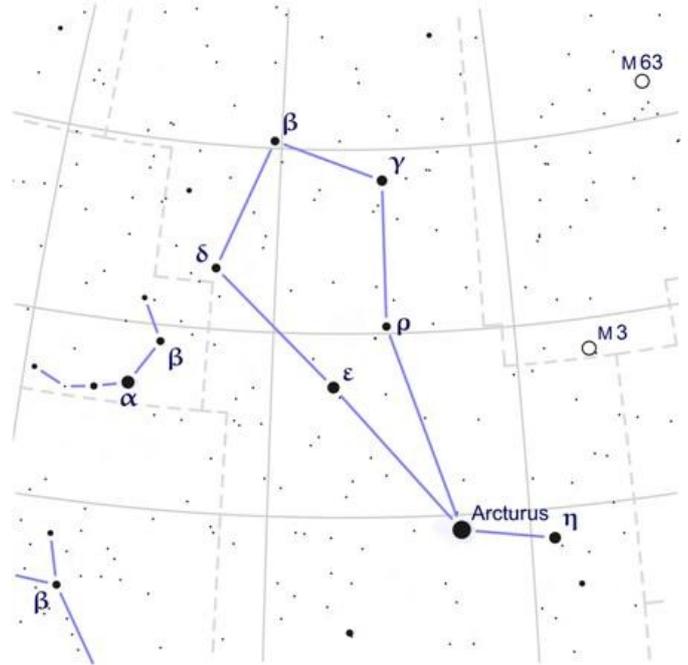
Another is that she is Demeter Goddess of the Harvest. The brightest star in the constellation Spica, is Latin for 'The Ear of Wheat'.

Yet another is that she is Persephone, daughter of Demeter.

There are others but Demeter seems the most likely.

BOOTES

The Herdsman – Star Atlas Chart 5



Bootes is a constellation mainly recognised due to its only bright star Arcturus. It is only because of Arcturus that I have included Bootes in this introduction. As there are no other bright stars in Bootes it is not the easiest constellation to learn at the beginning.

α Boo Arcturus is a red star of magnitude 0.05. It is 110 times brighter than the sun and is 37 light years away. Arcturus is the 4th brightest star in the sky

β Boo Nekkar is a yellow star of magnitude 3.5. It is 155 times brighter than the sun and is 219 light years away.

γ Boo Seginus is a blue-white star of magnitude 3. It is 35 times brighter than the sun and is 85 light years away.

δ Boo is a yellow star of magnitude 3.5. It is 46 times brighter than the sun and is 116 light years away.

ϵ Boo Izar is an orange star of magnitude 2.4. It is 407 times brighter than the sun and is 210 light years away.

η Boo Muphris is a yellow star of magnitude 2.7. It is 9 times brighter than the sun and is 37 light years away.

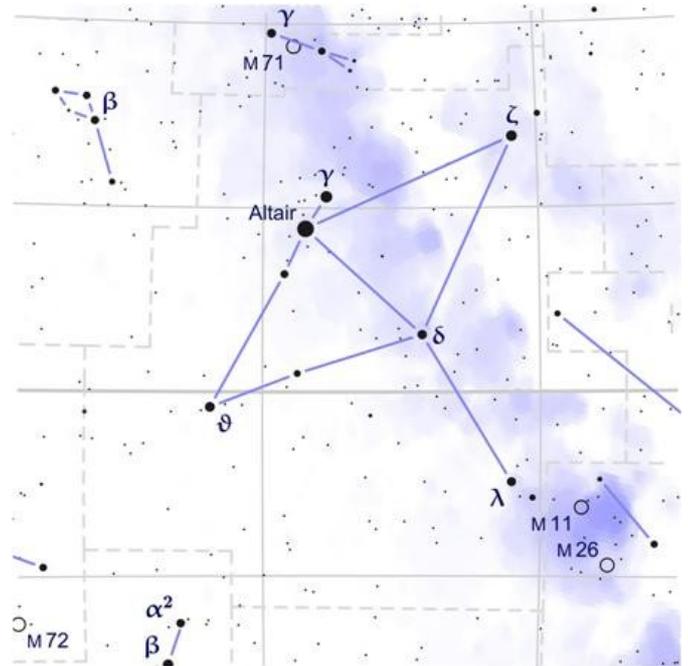
ρ Boo is an orange star of magnitude 3.6. It is 67 times brighter than the sun and is 148 light years away.

Myth.

The translation of the name Arcturus is 'Bear Driver'. Unfortunately the myths that surround Bootes contradict myths of the other constellation. Callisto's son was Arcas the Bear Driver. As Callisto had been changed into a bear, Zeus took both and made them neighbouring constellations so as to prevent Arcas from killing her. As you can see this differs from the story of Ursa Major where Arcas became the little bear.

AQUILA

The Eagle – Star Atlas Chart 6



Aquila is a constellation best known for its brightest star Altair.

α Aql Altair is a white star of magnitude 0.76. It is 11 times brighter than the sun and is 16.8 light years away. Altair is one of the fastest rotating stars known. It takes 6.5 hours to rotate once compared with our sun that takes 25.4 hours.

β Aql Alshain is a yellow star of magnitude 3.7. It is 5 times brighter than the sun and is 45 light years away.
 γ Aql Tarazed is an orange star of magnitude 2.7. It is 1400 times brighter than the sun and is 461 light years away.

δ Aql is a white star of magnitude 3.4. It is 9 times brighter than the sun and is 50 light years away.

η Aql is a white star of magnitude 3.9. It is 3130 times brighter than the sun and is 1173 light years away.

θ Aql is a blue-white star of magnitude 3.2 and is 287 light years away.

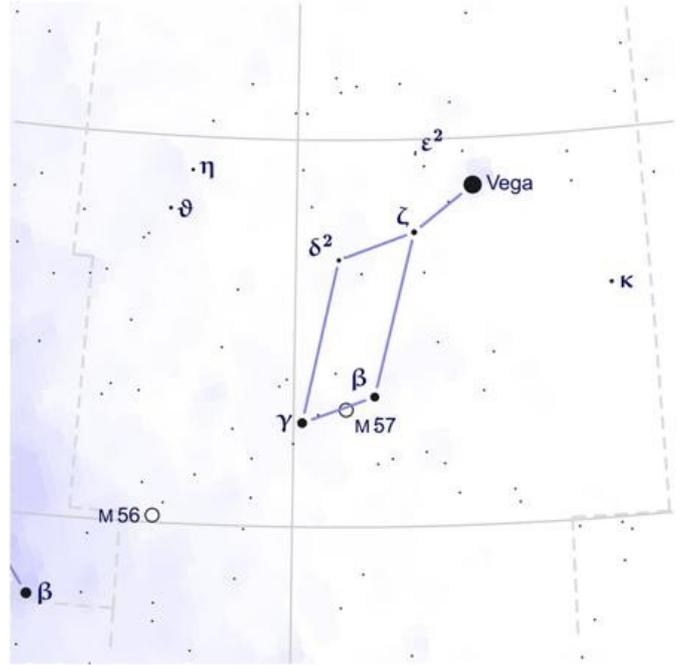
λ Aql is a blue star of magnitude 3.4. It is 3.4 times brighter than the sun and is 125 light years away.

Myth.

Aquila represents the eagle that was the bird of Zeus. It was famed for carrying the thunderbolts of Zeus. It is also thought to be the eagle that tormented Prometheus. Prometheus revealed the secret of fire to mankind whereas up until then it had only been known to the Gods. Zeus was furious and had Prometheus chained to a rock. Each day the eagle would fly down and peck out his liver. Being an immortal Prometheus couldn't die and each night his liver would grow back. The following day the eagle would once again fly down and peck out his liver.

LYRA

The Lyre also known as the Harp – Star Atlas Chart 6



Lyra is easily recognised by its brightest star Vega and its accompanying quadrangle of stars.

α Lyr Vega is a blue-white star of magnitude 0.03. It is 50 times brighter than the sun and is 25 light years away.

β Lyr Sheliak is a blue-white star of magnitude 3.5. It is 2440 times brighter than the sun and is 882 light years away.

γ Lyr Sulafat is a blue star of magnitude 3.3. It is 1620 times brighter than the sun and is 635 light years away.

δ Lyr is a blue star of magnitude 5.8. It is 549 times brighter than the sun and is 1080 light years away. It is a double star with a red companion that varies between the 4th and 5th magnitude.

ϵ Lyr is a white star of magnitude 4.7. It is 29 times brighter than the sun and is 162 light years away. It is one of the most famous quadruple stars. On a very clear night ϵ Lyr can be seen as a double with the unaided eye, otherwise it can easily be seen as a double with binoculars. It requires a small telescope with a high magnification to reveal each stars companions.

ζ Lyr is a blue-white star of magnitude 4.3. It is 35 times brighter than the sun and is 153 light years away. It is a double star with a companion of 6th magnitude that can be seen with binoculars.

M 56 is a globular cluster that on a clear night can be just be seen with binoculars.

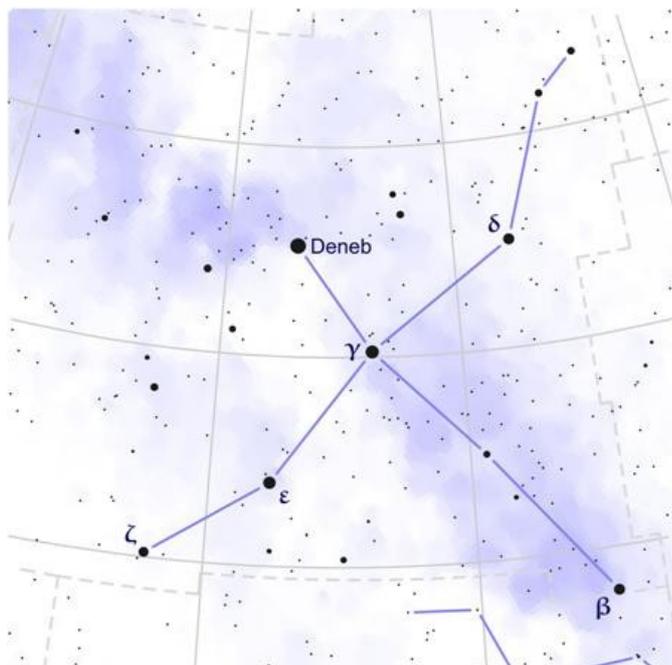
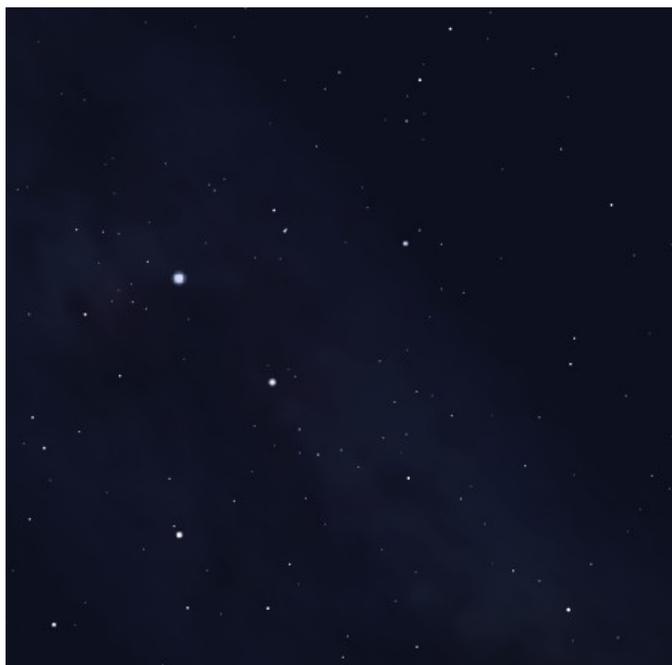
M 57 is the famous 'Ring Nebula'. It is difficult to see with binoculars, just a faint patch similar to a star. Small telescopes will reveal a elliptical patch whereas larger telescopes will actually reveal it as a ring.

Myth.

The Lyre was invented by Hermes the messenger God. He made it out of an empty tortoise shell with strings strung across it that produced a beautiful sound when played. Hermes gave the lyre to Apollo who in turn gave it to Orpheus. Orpheus accompanied Jason and the Argonauts as their harpist. Orpheus became famous for his music. There are various accounts of how Orpheus died. All agree that he was torn limb from limb, however they differ on who did it. They also differ on who carried the Lyre up into the stars, Some say that it was Zeus who sent down a bird to take it up while others say it was the Muses.

CYGNUS

The Swan, sometimes called the Northern Cross – Star Atlas Charts 6 & 7



Cygnus is easily recognised by its cross formation. It lies directly in the milky way and has many good binocular objects.

α Cyg Deneb is a blue-white supergiant star of magnitude 1.3. It is 265,000 times brighter than the sun and is 3260 light years away.

β Cyg Albired is a red giant star of magnitude 3.1. It is 722 times brighter than the sun and is 386 light years away. It is a binary star with a blue-white companion of magnitude 5.1. It makes a spectacular view through binoculars being one of the best coloured binaries in the sky.

γ Cyg Sadr is a yellow-white star of magnitude 2.2. It is 24,000 times brighter than the sun and is 1520 light years away.

δ Cyg is a blue star of magnitude 2.9. It is 169 times brighter than the sun and is 171 light years away.

ϵ Cyg is an orange star of magnitude 2.5. It is 42 times brighter than the sun and is 72 light years away.

ζ Cyg is a yellow-white star of magnitude 3.2. It is 95 times brighter than the sun and is 151 light years away.

η Cyg is an orange star of magnitude 3.9. It is 43 times brighter than the sun and is 139 light years away.

ι Cyg is a blue-white star of magnitude 3.8. It is 38 times brighter than the sun and is 122 light years away.

M 29 is an open cluster that is visible with binoculars.

M 39 is a fairly large open cluster. With good viewing conditions it is just visible to the unaided eye. With small binoculars it is seen as a nebulous patch but with larger binoculars 10 x 50 it is possible to see the brighter stars in the cluster.

NGC 7000 is the North America Nebula. It is a difficult object to see with binoculars due to the faintness of the nebula and requires almost perfect viewing conditions. Due to various circumstances it is the only object in this book that I have never managed to see with binoculars.

IC 5070 the Pelican Nebula needs the same viewing conditions as NGC 7000 to be seen in binoculars.

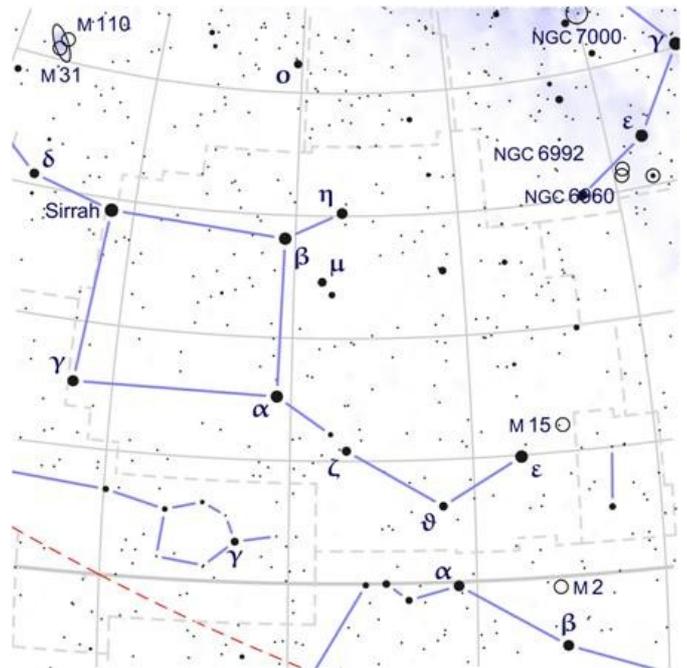
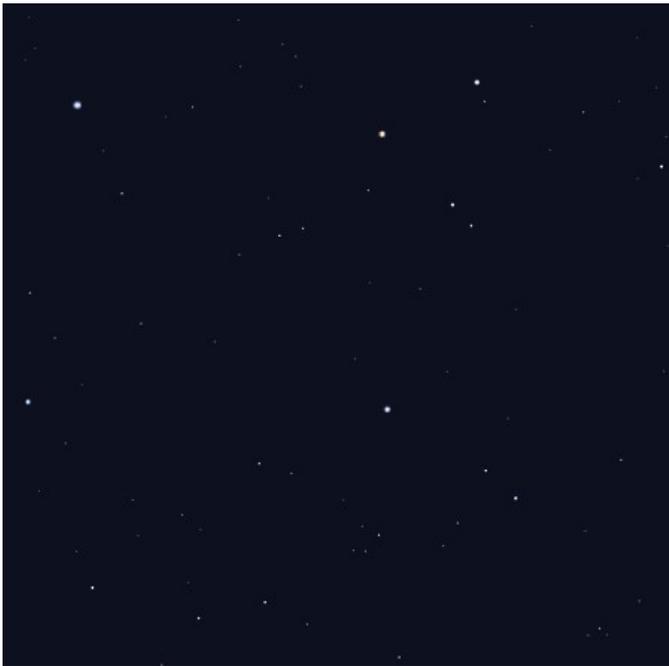
NGC 6960, 6992 and 6995 are collectively known as the Veil Nebula. It spans quite a large area but some parts are visible through binoculars.

Myth.

The swan represents Zeus in one of the forms that he used to disguise himself while amongst humans.

PEGASUS

The Flying Horse – Star Atlas Chart 7



Pegasus is easily recognised by the 4 bright stars that make up what is known as the square of Pegasus which take up quite a large area of the sky. The top left star actually now belongs to the constellation of Andromeda and this is why there is not a δ Pegasi.

α Peg Markab is a blue star of magnitude 2.5. It is 158 times brighter than the sun and is 140 light years away.

β Peg Scheat is a red star of magnitude 2.4. It is 338 times brighter than the sun and is 199 light years away.

γ Peg Algenib is a star of magnitude 2.8. It is 660 times brighter than the sun and is 333 light years away.

ϵ Peg Enif is an orange supergiant star of magnitude 2.4. It is 4060 times brighter than the sun and is 673 light years away. It is a double star with a companion of 9th magnitude which is just visible with binoculars.

ζ Peg Homan is a blue star of magnitude 3.4. It is 152 times brighter than the sun and is 209 light years away.

η Peg Matar is a yellow-white star of magnitude 2.9. It is 250 times brighter than the sun and is 215 light years away.

θ Peg Biham is a blue-white star of magnitude 3.5. It is 29 times brighter than the sun and is 97 light years away.

μ Peg Sadalbari is a red star of magnitude 3.5. It is 43 times brighter than the sun and is 117 light years away.

ξ Peg is a white star of magnitude 4.2. It is 4.7 times brighter than the sun and is 53 light years away.

M 15 is a dense globular cluster. It is visible as a misty patch through binoculars and small telescopes. It takes large telescopes to resolve any stars of the cluster and even then its core is so dense that it is impossible to resolve individual stars in the core.

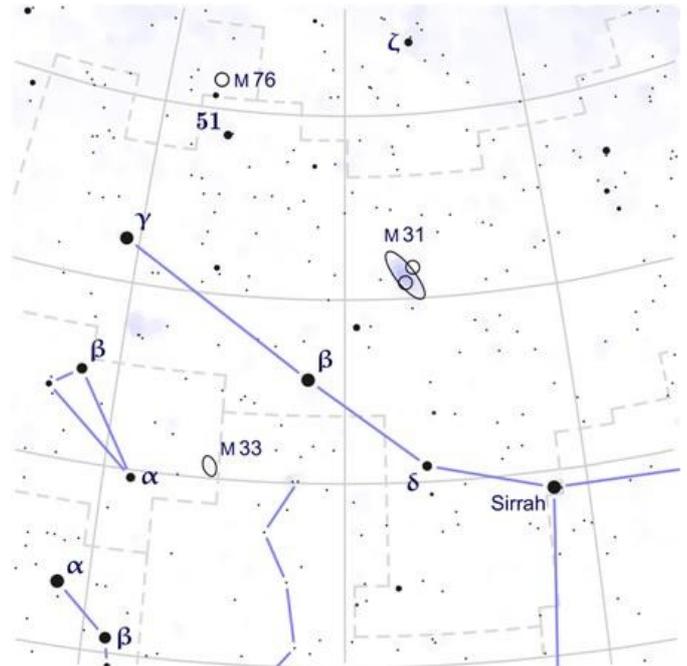
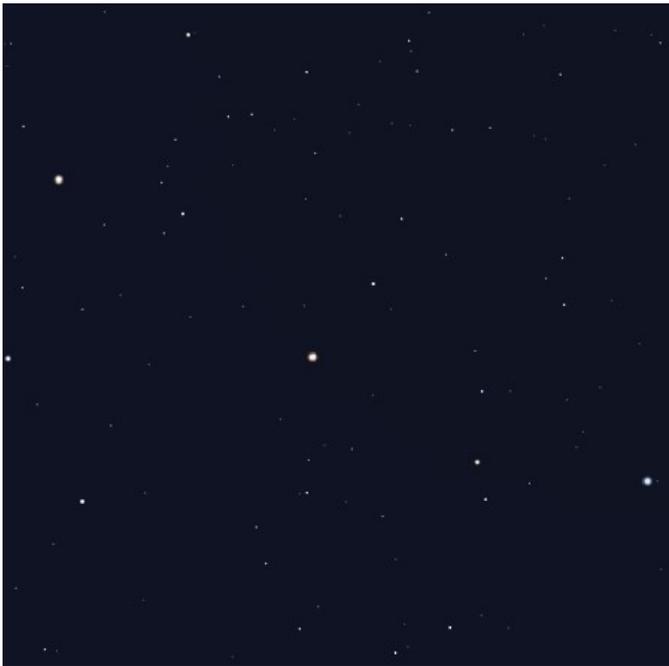
Myth.

Pegasus was said to have sprung from the body of Medusa when Perseus cut off her head. Others say that it was the blood of Medusa mixing with the sea that formed Pegasus. After leaving Perseus, Pegasus flew to mount Helicon where the Muses lived. As he landed his hoof struck the ground creating a spring that gushed forth. The spring was known as the Hippocrene, the Horses Fountain and it was said that anybody who drank from it would be gifted with the art of poetry.

The hero Bellerophon claimed Pegasus as his own and had many adventures with the horse. Bellerophon grew so bold that he decided to fly up to the Gods on Mount Olympus. This angered Zeus who sent an insect to sting Pegasus. Pegasus reared up and threw off Bellerophon who fell to earth and was blinded. Pegasus carried on to Mount Olympus where Zeus finally placed him in the stars.

ANDROMEDA

Andromeda – Star Atlas Chart 2



Andromeda is a large constellation famous for the Andromeda Nebula.

α And Sirrah (Alpheratz) is a blue-white star of magnitude 2.1. It is 100 times brighter than the sun and is 97 light years away.

β And Mirach is a red star of magnitude 2.1. It is 476 times brighter than the sun and is 199 light years away.

γ And Almak is an orange star of magnitude 2.1. It is 1500 times brighter than the sun and is 355 light years away.

δ And is an orange star of magnitude 3.3. It is 40 times brighter than the sun and is 101 light years away.

μ And is a blue-white star of magnitude 3.9. It is 43 times brighter than the sun and is 136 light years away.

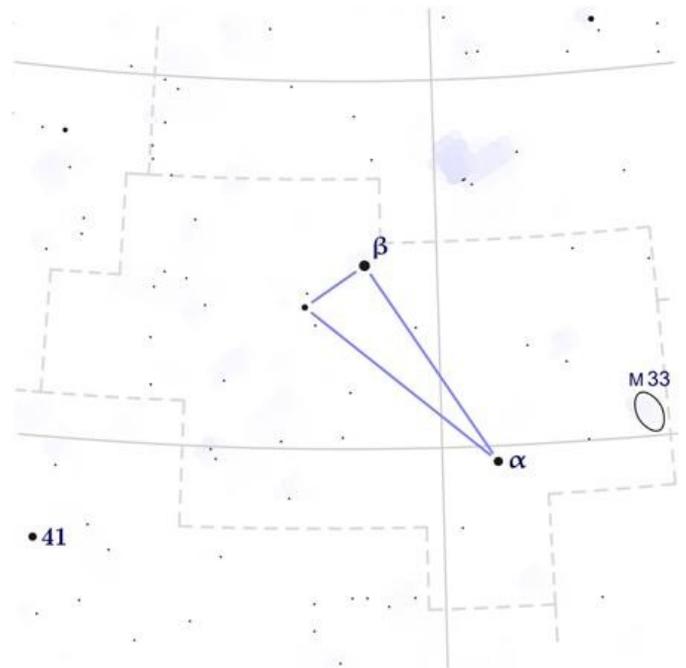
M 31 is the famous Andromeda Nebula. It is the closest galaxy to our own and is 2.5 million light years away. It is visible to the unaided eye on a reasonable night as a large elliptical misty glow. Because of its size it is a good object through binoculars, but if you are using a telescope then it is best to use a low power with a wide field of view.

Myth.

Andromeda was the daughter of King Cepheus and Queen Cassiopeia. Because of Cassiopeia's boasts Andromeda was chained to a rock to be sacrificed to the sea monster Cetus. Perseus killed Cetus and rescued Andromeda. Perseus and Andromeda got married and unusually for the myths had a happy life before being placed together in the stars.

TRIANGULUM

The Triangle – Star Atlas Chart 2



Triangulum is a small constellation that has been included in this introduction because of the M 33 nebula. α Tri Elmuthalleth is a white star of magnitude 3.4. It is 14 times brighter than the sun and is 64 light years away.

β Tri is a white star of magnitude 3 and is 124 light years away.

γ Tri is a blue-white star of magnitude 4. It is 27 times brighter than the sun and is 117 light years away.

M 33 is a spiral galaxy almost face on to us. It is faint but with exceptionally good conditions can be seen with the unaided eye. This makes it the furthest and oldest object that can be seen with the unaided eye at about 3 million light years away, the light having left there 3 million years ago. It is also best to view it through binoculars on a dark night.

MONTHLY STAR CHARTS 2009

The monthly star charts over the following pages contain two views of the night sky for each month. The chart on the first page shows details of the constellations and the chart on the next page shows how you would see the sky itself. To use the charts it is best to print them out. The edge of the charts show the horizon. With the page the normal way up it is showing the stars as you would see them if you are facing South. If you want to see the stars when looking North then rotate the page until it is upside down compared with normal. The word 'North' will now be the right way up and you will see the stars as they are looking north. The same applies if you want to see the stars as they are to the east or west. Just rotate the page until the word for the direction you want to observe is the right way up.

The charts are designed to show the positions of the stars at 21:00 Greenwich Mean Time on the 15th of each month (except for the summer months). As the Earth rotates on its axis the stars seem to move across the sky. Because of this the same chart can be used to show the stars roughly as they are at 22:00 GMT on the 1st of the month and at 20:00 GMT at the end of the month. Most Astronomical Almanacs only show the time in Universal Time UT (the same as GMT) so you have to add an hour on yourselves to the times when we are in BST. As this is an introduction to astronomy I have adjusted the times on the charts for when we are in British Summer Time so you do not have to make any adjustments. The same goes for all other times shown such as sunrise and sunset times.

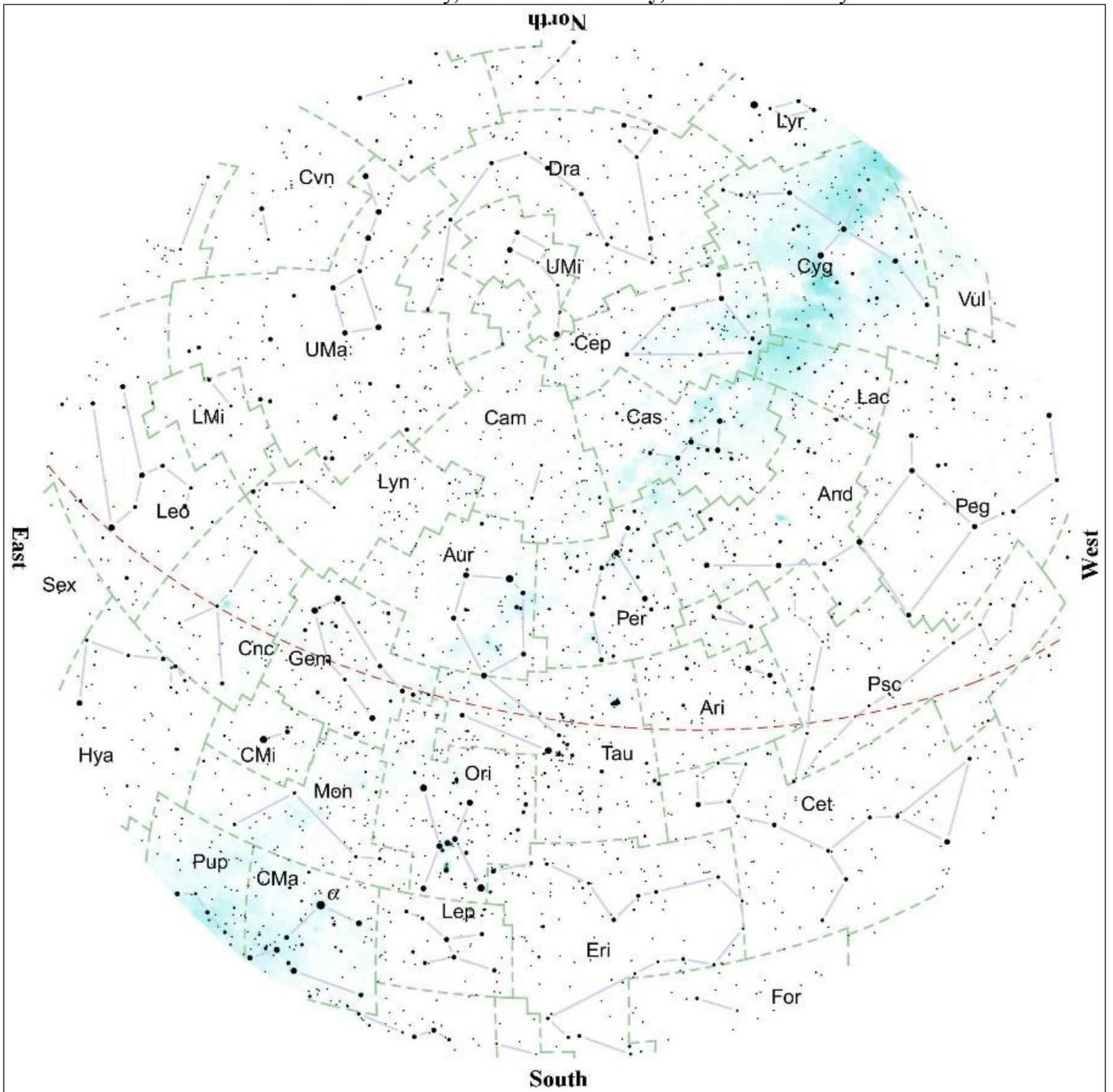
All times are calculated for the north east of Bristol (rounded up to Latitude 51:30:00 North, Longitude 2:30:00 West) but are good for all of Bristol and the surrounding area.

Most of the constellations mentioned in the monthly star charts are constellations that are only visible for a few months each year. They are best placed for observation when they are in the south as this is when they will be at their highest point above the horizon. Constellations that are visible all the year round are called circumpolar constellations. As these can be observed on any night with a clear sky they are not mentioned in these monthly charts.

Some constellations named in the monthly star charts are preceded by an asterisk *. This shows that the constellation can only be observed from this latitude when it is directly south and as such is close to the horizon. To observe the constellation you will need an unobstructed view looking south, the higher up the better and no light pollution.

NIGHT SKY JANUARY

22:00 1st January, 21:00 15th January, 20:00 31st January



NIGHT SKY JANUARY

22:00 1st January, 21:00 15th January, 20:00 31st January



Sun	Rise	Set
1 st	08:17	16:10
15 th	08:10	16:29
31 st	07:50	16:57
Moon	Rise	Set
1 st	10:29	21:43
15 th	22:42	09:55
31 st	09:15	23:18
New Moon		26th
First Quarter		4th
Full Moon		11th
Last Quarter		18th
Planet	Rise	Set
Mercury	1 st 09:29	17:40
Mercury	15 th 08:30	17:41
Venus	1 st 10:33	20:19
Venus	15 th 09:59	20:53
Mars	1 st 07:52	15:31
Mars	15 th 07:39	15:27
Jupiter	1 st 09:19	17:43
Jupiter	15 th 08:33	17:06
Saturn	1 st 22:29	11:30
Saturn	15 th 21:33	10:35

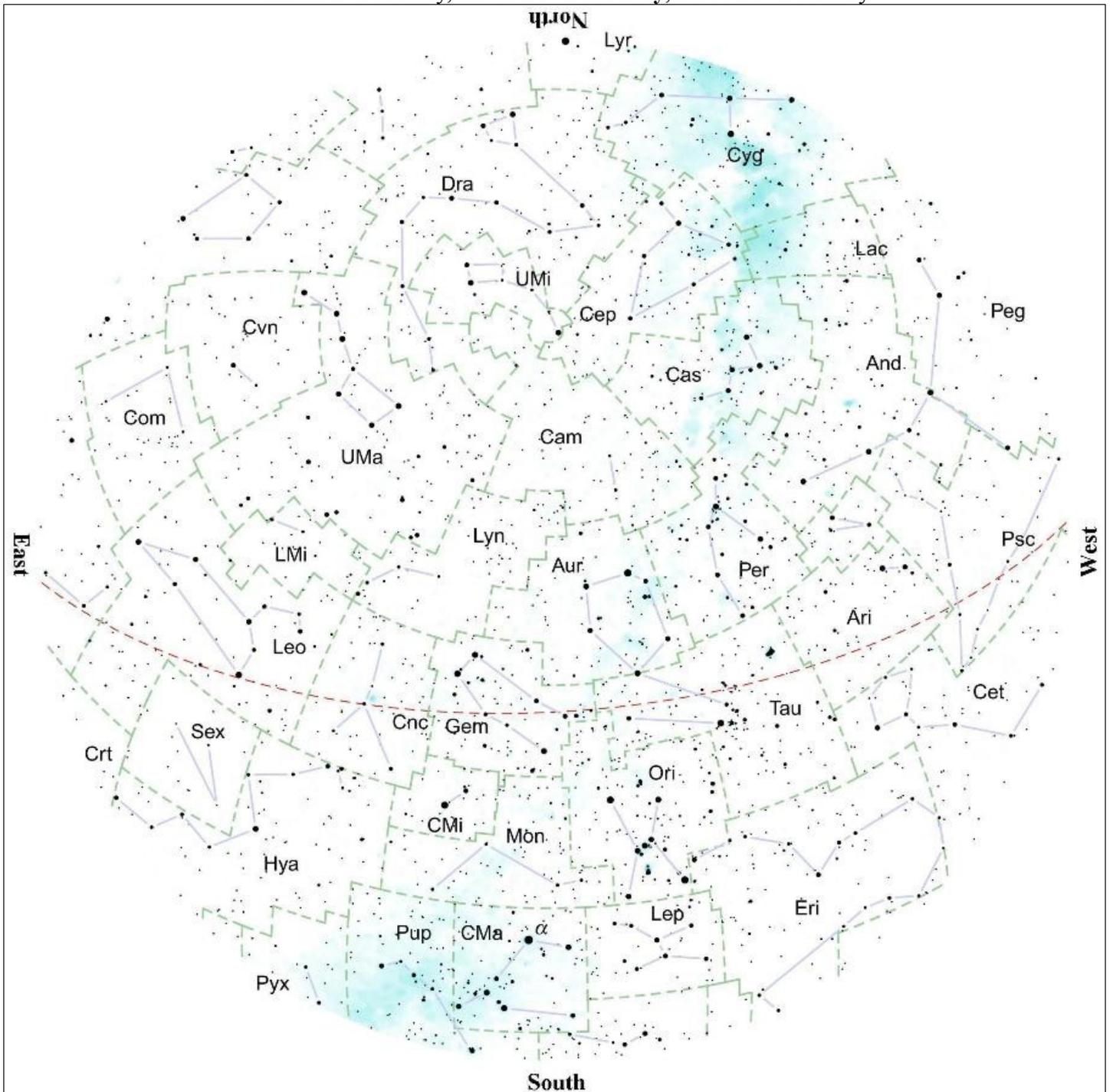
Mercury is just visible after sunset during the first week of January.
 Venus is the brightest object in the sky after sunset in the south west.
 Mars is not visible this month.
 Jupiter is not visible this month.
 Saturn rises in the east and should be visible for observation by 22:30

M45 the Pleiades are well placed for observing this month. Also known as the seven sisters 6 of the stars can be seen with the unaided eye.
 Another open cluster that is worth observing is the Hyades. This cluster can be seen just below Aldeberan in Taurus. Although visible to the naked eye it is well worth a look through binoculars.
 Collinder 70 is a large open cluster that surrounds the belt of Orion. Viewed through binoculars it reveals a rich star field.
 M42 is the famous Orion Nebula and is visible to the naked eye. It lies in the sword of Orion and makes rewarding viewing through binoculars and telescopes.
 Constellations best placed for observing are Eridanus, *Fornax, Perseus and Taurus.

The Quadrantids meteor shower can be one of the strongest showers of the year but conditions in this country need to be exactly right. The Quadrantids radiate from where the constellations of Draco, Hercules and Bootes meet. The shower is active from January 1st to the 5th with the maximum occurring on the evening of January 3rd and morning January 4th. The maximum hourly rate is an average of 120 meteors but can range from 60 to 200. All activity normally occurs after 23:00.

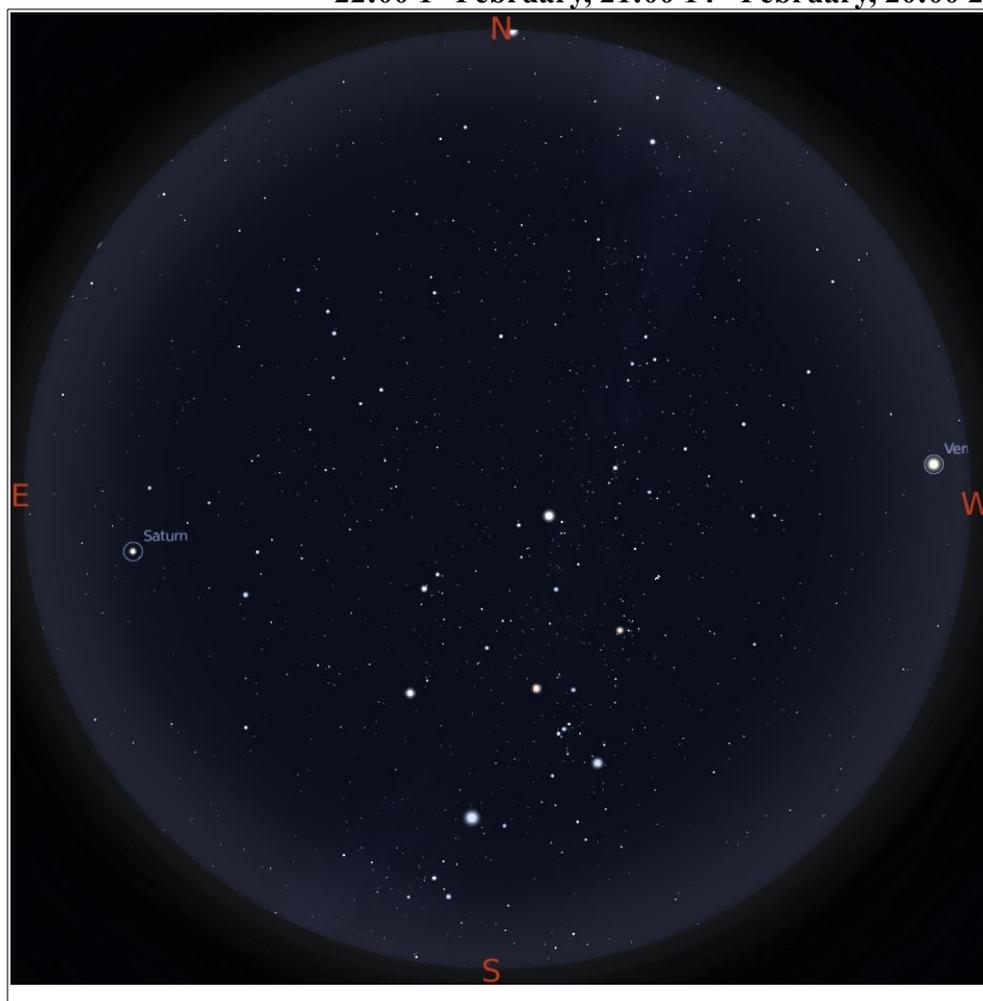
NIGHT SKY FEBRUARY

22:00 1st February, 21:00 14th February, 20:00 28th February



NIGHT SKY FEBRUARY

22:00 1st February, 21:00 14th February, 20:00 28th February



Sun	Rise	Set
1 st	07:48	16:59
14 th	07:25	17:23
28 th	06:56	17:49
Moon	Rise	Set
1 st	09:30	00:39
14 th	22:53	08:43
28 th	07:28	22:27
New Moon	28	25 th
First Quarter	2 th	
Full Moon	9 th	
Last Quarter	16 th	
Planet	Rise	Set
Mercury	1 st	06:33 15:19
Mercury	14 th	06:21 14:56
Venus	1 st	09:07 21:23
Venus	14 th	08:20 21:34
Mars	1 st	07:16 15:28
Mars	14 th	06:52 15:33
Jupiter	1 st	07:37 16:21
Jupiter	14 th	06:54 15:47
Saturn	1 st	20:21 09:27
Saturn	14 th	19:25 08:35

Mercury is visible in the morning towards the south east before sunrise.

Venus is the brightest object in the sky after sunset. It is visible in the south west, setting by 21:30.

Mars rises just after Mercury but will be difficult to see before sunrise.

Jupiter rises at about the same time as Mars and may be visible for a short while just before sunrise.

Saturn is the only planet that is visible during the evening and throughout the night. It is easy to see just below Leo.

Orion still continues to dominate the southern sky during the evening. M 42 in Orion's sword is visible to the unaided eye as a star with slight nebulosity surrounding it. Through binoculars the nebula is easily visible and combined with the other stars in Orion's sword, makes a spectacular view.

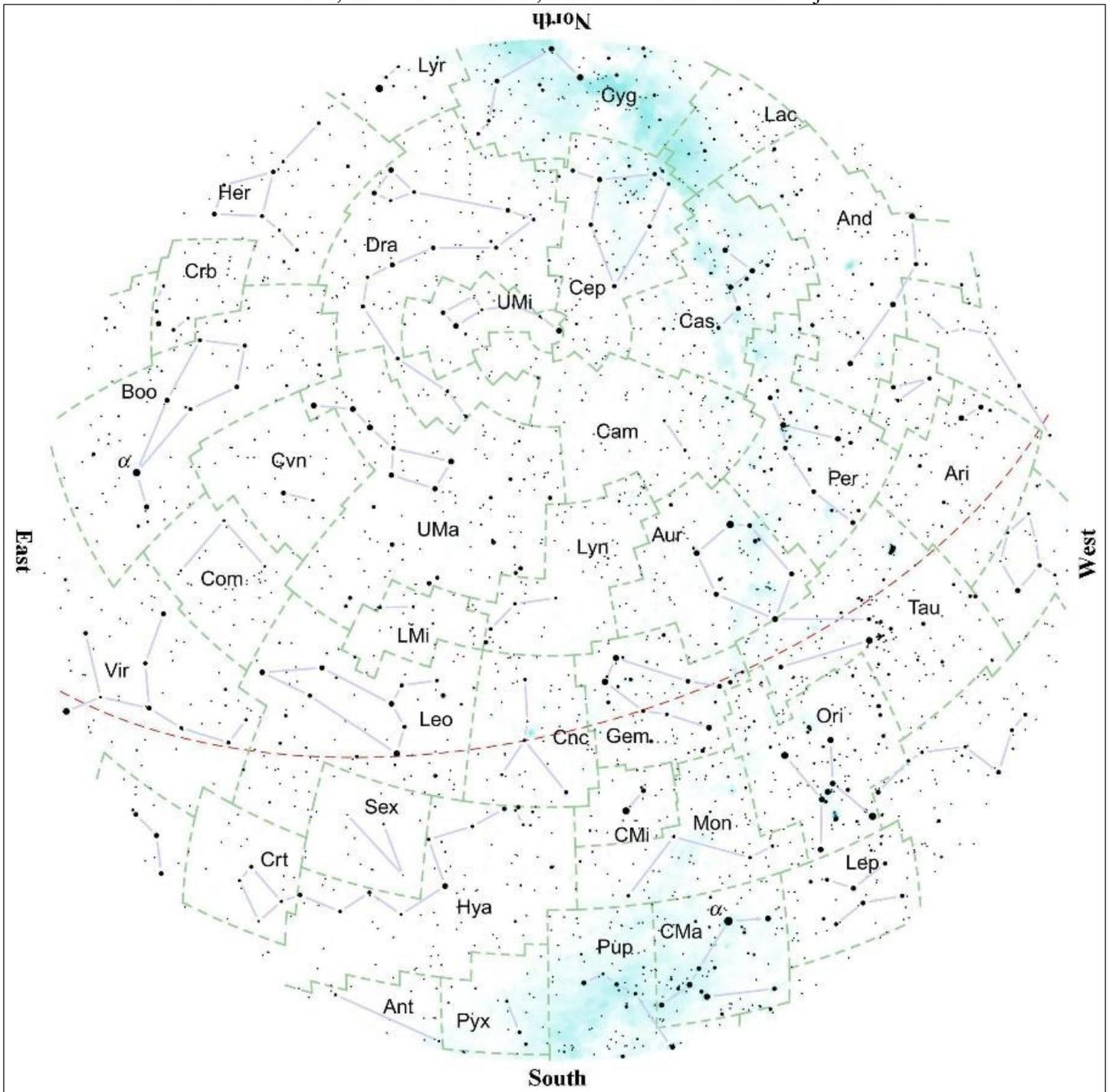
Follow the line of Orion's belt down to Sirius the brightest star in the sky in the constellation of Canis Major. The whole of the Canis Major is above the horizon and this is the best month to view it. M 41 in Canis Major is an open cluster that is just visible to the unaided eye. It is just below Sirius. Follow a curve up from Sirius and we find Procyon in Canis Minor. Almost half way between Sirius and Procyon is M50 in Monoceros. This is an open cluster that is visible through binoculars. Continue the curve upwards from Procyon and we come to Pollux and Castor in the constellation of Gemini. M 35 in Gemini is an open cluster easily visible in binoculars. Continue the curve and we arrive at Capella in the constellation of Auriga. Auriga contains three open clusters M 36, M 37 and M 38, all of which are visible through binoculars.

Also best placed for observation this month are the constellations Lepus and *Columba.

There are no meteor showers this month.

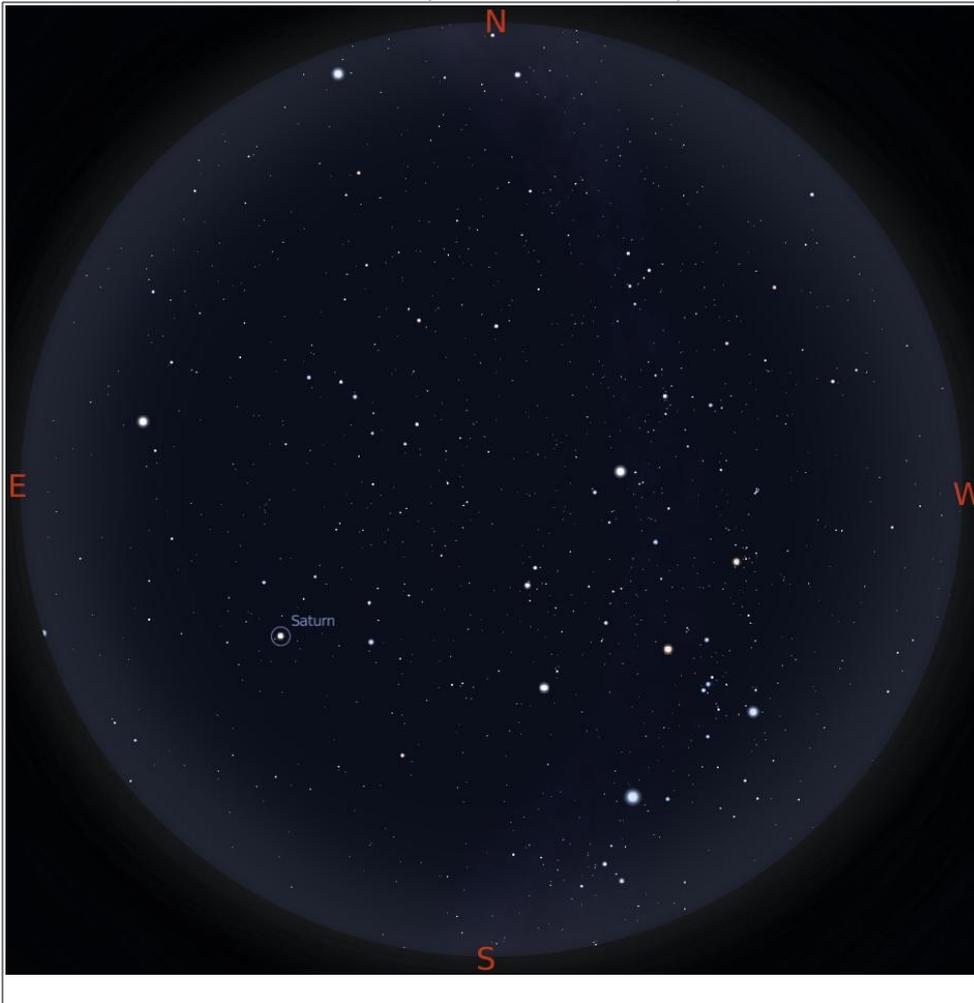
NIGHT SKY MARCH

22:00 1st March, **21:00 15th March**, 21:00 31st March. Time adjusted for BST.



NIGHT SKY MARCH

22:00 1st March, 21:00 15th March, 21:00 31st March. Time adjusted for BST.



Sun	Rise	Set	
1 st	06:54	17:50	
15 th	06:22	18:15	
31 st	06:45	19:42	
Moon	Rise	Set	
1 st	07:56	23:49	
15 th	23:04	07:27	
31 st	08:36	01:18	
New Moon	26th		
First Quarter	4th		
Full Moon	11th		
Last Quarter	18th		
Planet	Rise	Set	
Mercury	1 st	06:23	15:34
Mercury	15 th	06:15	16:44
Venus	1 st	07:15	21:22
Venus	15 th	06:06	20:29
Mars	1 st	06:21	15:40
Mars	15 th	05:48	15:48
Jupiter	1 st	06:03	15:07
Jupiter	15 th	05:15	14:29
Saturn	1 st	18:20	07:34
Saturn	15 th	17:18	06:37

Mercury is not visible this month.

Venus is still visible after sunset but is low in the sky towards the western horizon.

Mars will be visible just before sunrise.

Saturn rises just after sunset in the constellation of Leo.

Jupiter rises an hour before sunrise in the constellation of Capricorn.

The Vernal Equinox is on the 20th of March at 11:43. This is the time when the sun is directly over the equator, moving from the southern hemisphere to the northern hemisphere.

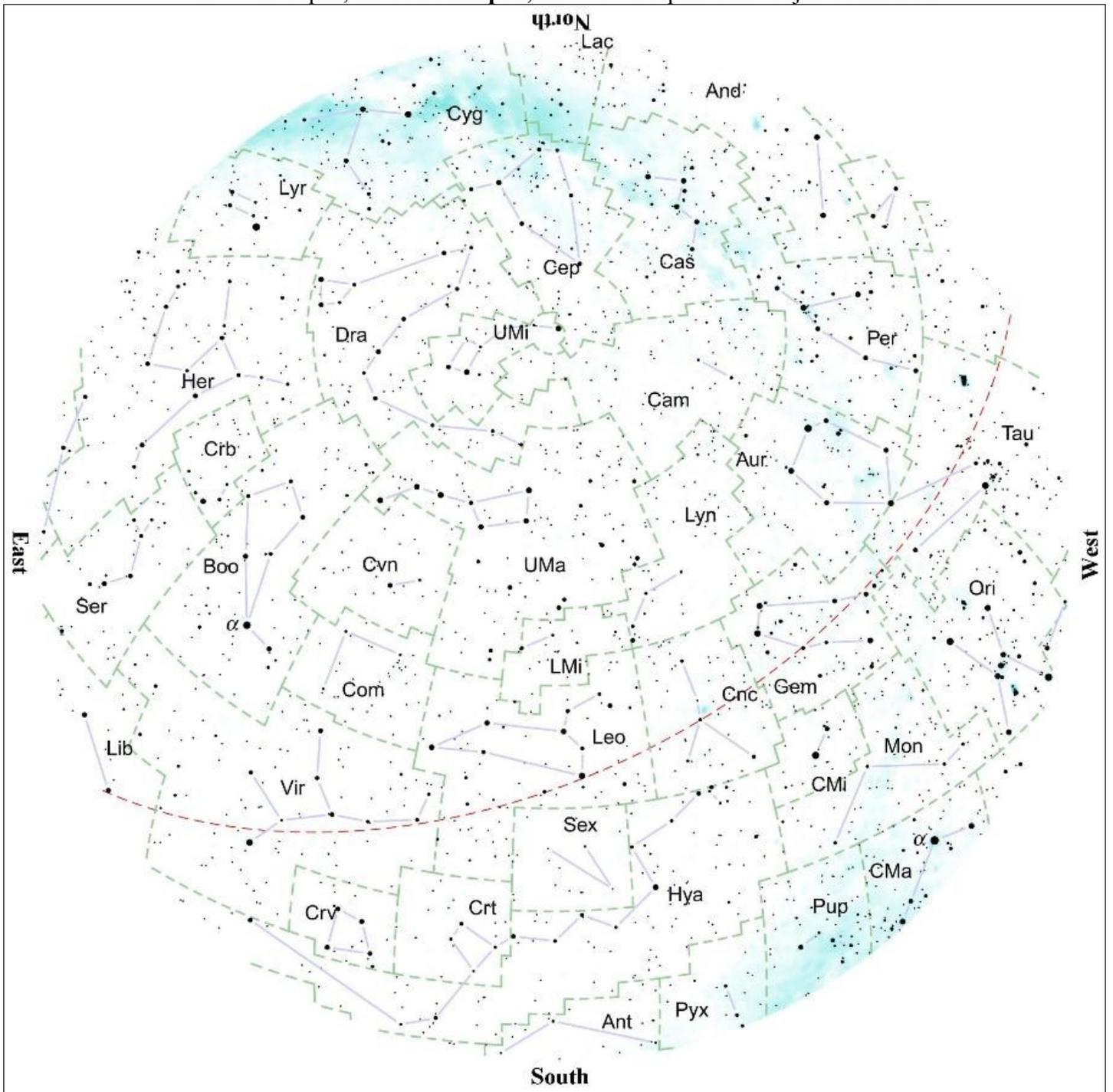
Between the bright stars Castor and Pollux and the easily recognised sickle of Leo is the faint constellation of Cancer. Although faint it is easy enough to pick out as the stars surrounding it are fainter still. Between and to the right of γ and δ Cnc is M 44 Praesepe, the Beehive cluster. To the unaided eye a nebulous patch, this open cluster is easily visible and best viewed through binoculars. To the right of α Cnc is M 67. This open cluster is not visible to the unaided eye but is easily visible through binoculars. Following a line down from β Cnc we find M 48 an open cluster in Hydra which is easily visible in binoculars. Another open cluster which is a fine object to observe is M 47 in Puppis. To locate M47 follow a line left from Sirius and a line down from Procyon. Where these line intersect you will find M 47.

Constellations best placed for observing are Cancer, Canis Major, Canis Minor, Gemini, Lynx, Monoceros, *Puppis and *Pyxis.

There are no meteor showers this month.

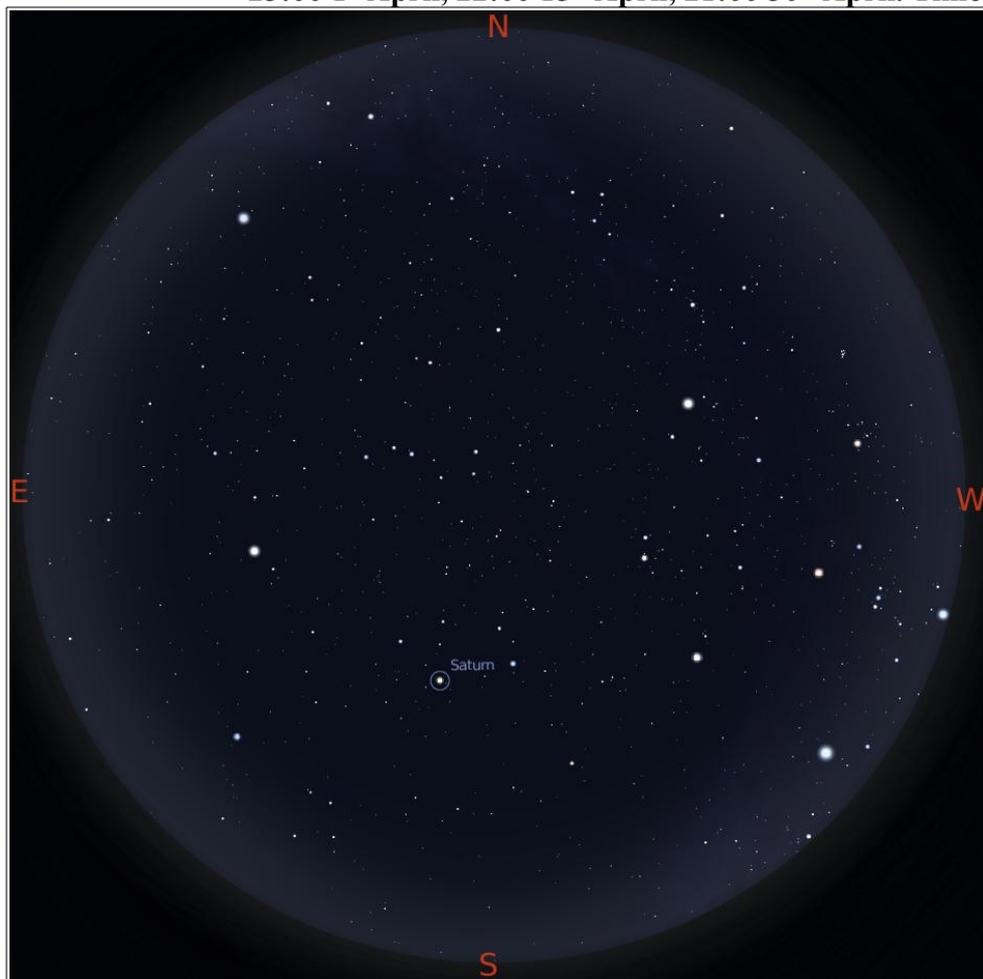
NIGHT SKY APRIL

23:00 1st April, **22:00 15th April**, 21:00 30th April. Time adjusted for BST.



NIGHT SKY APRIL

23:00 1st April, 22:00 15th April, 21:00 30th April. Time adjusted for BST.



Sun		Rise	Set
1 st		06:43	19:44
15 th		06:12	20:08
30 th		05:41	20:33
Moon		Rise	Set
1 st		09:34	02:28
15 th		02:03	09:07
30 th		09:58	02:02
New Moon		25 th	
First Quarter		2 nd	
Full Moon		9 th	
Last Quarter		17 th	
Planet		Rise	Set
Mercury	1 st	06:54	19:43
Mercury	15 th	06:35	21:38
Venus	1 st	05:47	19:26
Venus	15 th	05:01	17:52
Mars	1 st	06:06	16:57
Mars	15 th	05:29	17:04
Jupiter	1 st	05:16	14:41
Jupiter	15 th	04:26	14:00
Saturn	1 st	17:04	06:28
Saturn	15 th	16:04	05:31

Mercury is not visible until the 12th of April when it is just visible after sunset.

Venus rises in the east an hour before sunrise and is easily visible.

Mars rises just after Venus and is visible before sunrise.

Jupiter is a morning object rising in the south east. It does not rise very high in the sky before sunrise.

Saturn is visible in the sky after sunset and remains visible throughout the night until it sets just before sunrise.

With the clocks going forward in March the sun is now setting over an hour later than it was in March. Any observing will now have to be done later on in the evening.

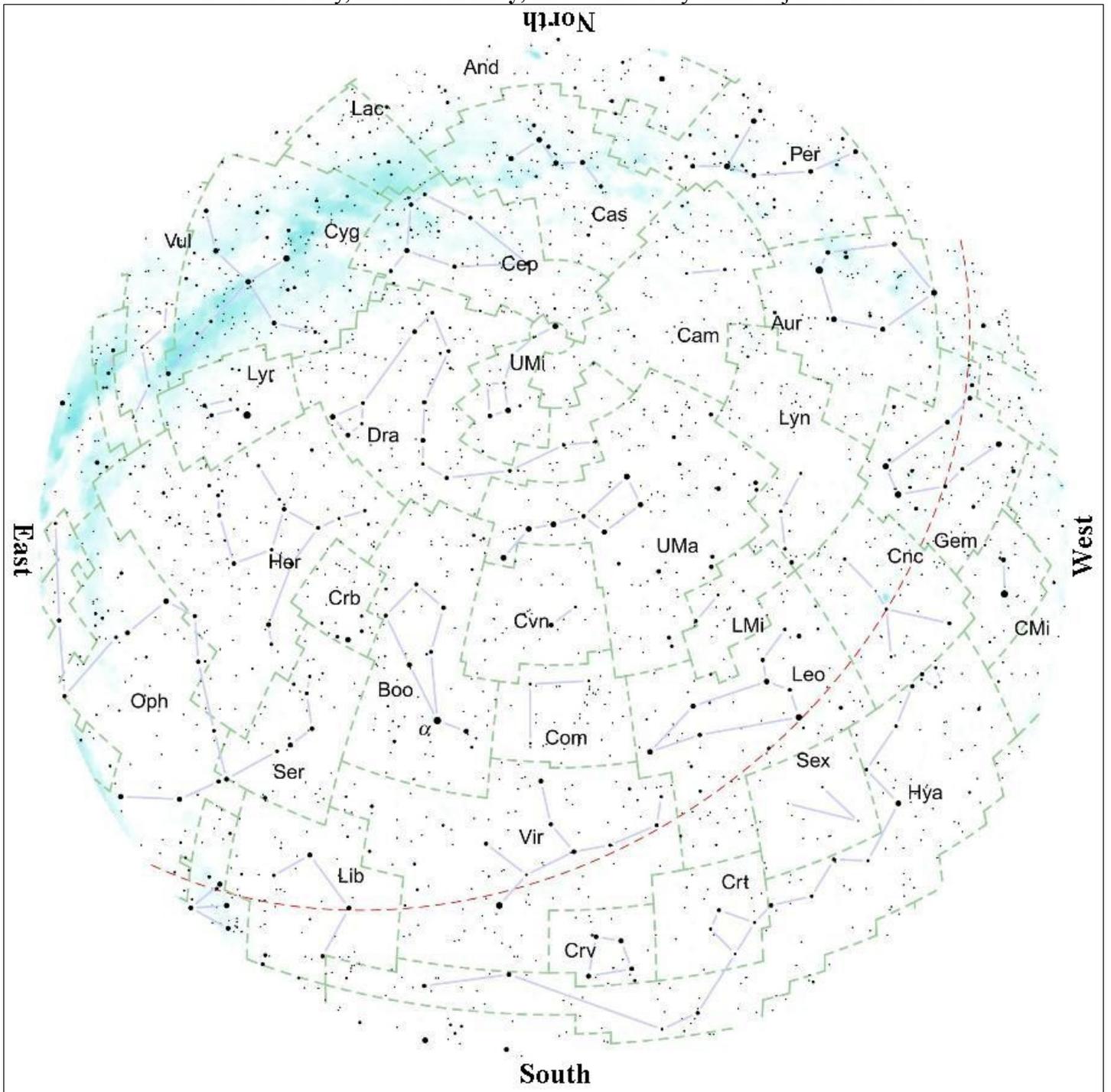
γ Leo is an optical double which is easily resolved with binoculars. M65 and M66 in Leo are both spiral galaxies that are almost edge on. They should just be visible through binoculars as small fuzzy spots.

Constellations best placed for observing are *Antlia, Corvus, Crater, Hydra, Leo, Leo Minor and Sextans.

The Lyrid meteor marks the end of a rather bland period for meteors between January and April. The Lyrids radiate from an area between Lyra and Hercules and are active between April the 16th and the 25th. The maximum occurs on the April the 22nd at 11:00 which is unfortunately during daylight, where the hourly rate can be between 18 and 90 meteors. However it should still be possible to see meteors in the early hours of the 22nd. This shower can be unpredictable sometimes resulting in many more meteors than normal so it is well worth watching.

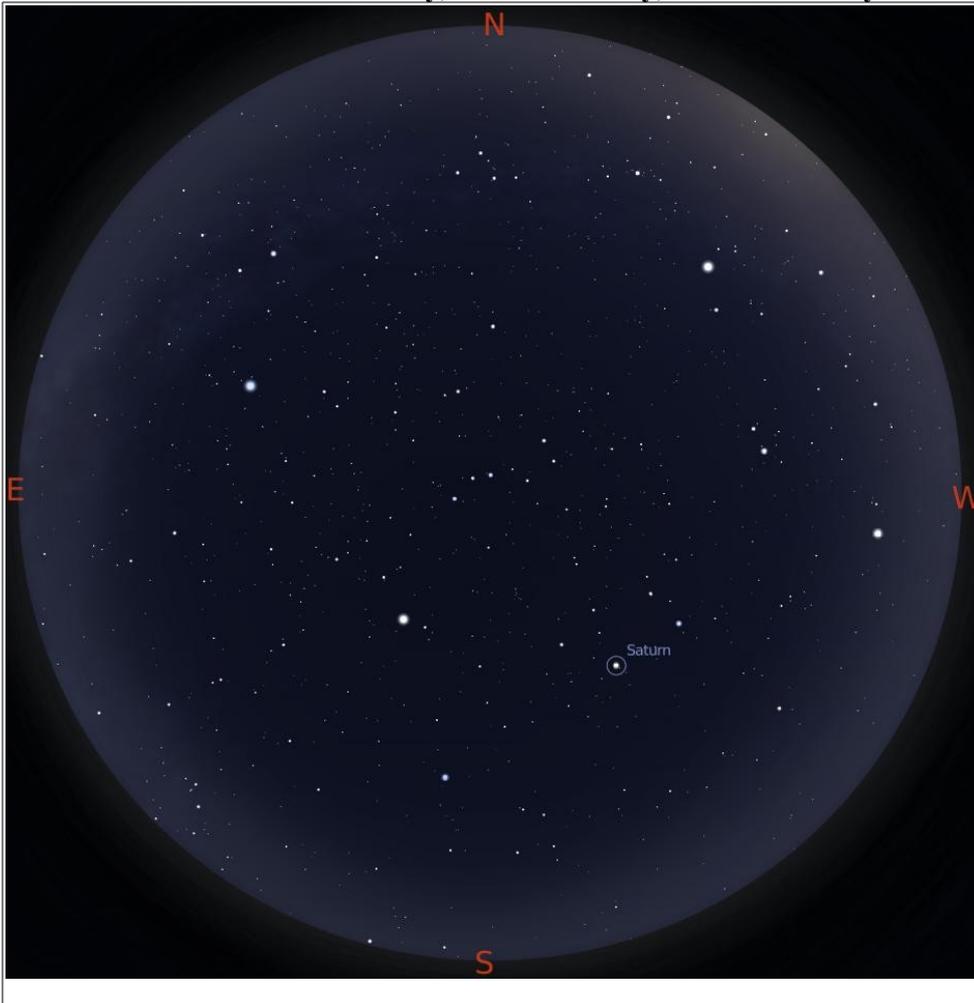
NIGHT SKY MAY

23:30 1st May, **22:30 15th May**, 21:30 31st May. Time adjusted for BST.



NIGHT SKY MAY

23:30 1st May, 22:30 15th May, 21:30 31st May. Time adjusted for BST.



Sun		Rise	Set
1 st		05:39	20:35
15 th		05:15	20:57
31 st		04:56	21:19
Moon		Rise	Set
1 st		11:24	02:34
15 th		01:38	10:15
31 st		13:20	01:38
New Moon		24th	
First Quarter		1 st	31st
Full Moon		9th	
Last Quarter		17th	
Planet		Rise	Set
Mercury	1 st	06:09	22:35
Mercury	15 th	05:33	21:22
Venus	1 st	04:24	16:55
Venus	15 th	03:56	16:41
Mars	1 st	04:47	17:11
Mars	15 th	04:10	17:17
Jupiter	1 st	03:28	13:10
Jupiter	15 th	02:37	12:24
Saturn	1 st	14:57	04:27
Saturn	15 th	14:01	03:31

Mercury is not visible during May although it might just be possible to see it before sunrise during the first week of the month.

Venus is now a brilliant object in the morning sky, rising in the East in the constellation of Pisces.

Mars rises just after Venus in Pisces and should just be visible before sunrise.

Jupiter rises in the south east just before Saturn sets and is beginning to reach an observable height in the sky before sunrise.

Saturn is high in the sky and due south at sunset. Saturn's ring system is almost edge on now so will not be much of a sight for the the rest of the year.

The sun is now setting late in the evening meaning that any serious observing cannot take place until after 22:30.

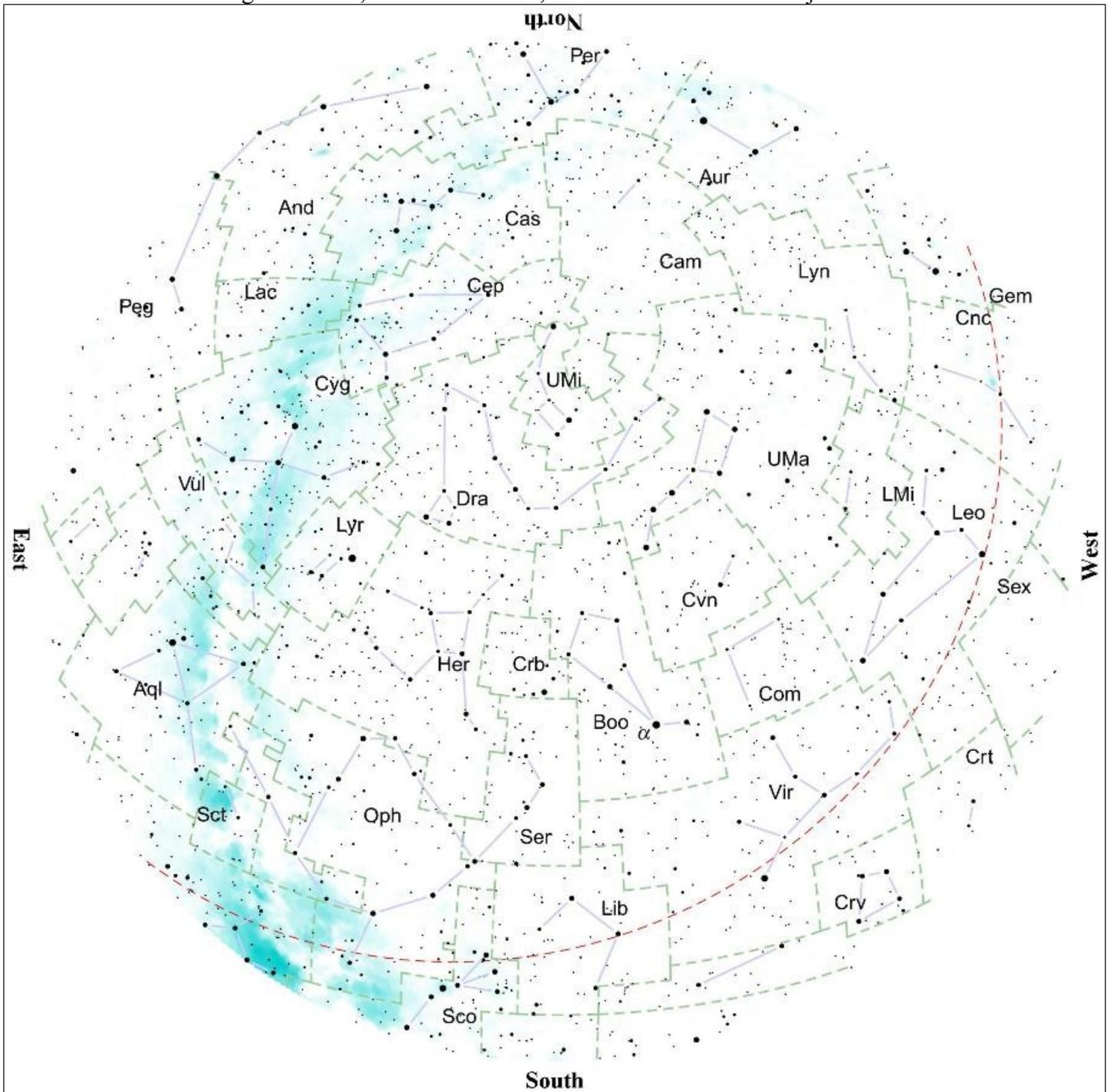
There is a constellation that lies between Leo and Bootes called Coma Berenices. You can find it on chart 5 in the atlas at the end of this book looking like an upside down L. γ Coma Berenices is the star at the right of the inverted L and immediately below is the Coma Berenices Star Cluster. This is visible to the unaided eye.

Other constellation that are well placed for viewing in May are Bootes, Canes Venatici and Virgo. Libra is also well placed for viewing but not until after midnight.

There are no meteor showers this month.

NIGHT SKY JUNE

Midnight 1st June, **23:00 15th June**, 22:00 30th June. Time adjusted for BST.



NIGHT SKY JUNE

Midnight 1st June, 23:00 15th June, 22:00 30th June. Time adjusted for BST.



Sun		Rise	Set
1 st		04:55	21:20
15 th		04:49	21:33
30 th		04:54	21:32
Moon		Rise	Set
1 st		14:38	01:53
15 th		00:47	12:46
30 th		15:01	00:45
New Moon		22nd	
First Quarter		29th	
Full Moon		7th	
Last Quarter		15th	
Planet		Rise	Set
Mercury	1 st	04:34	19:20
Mercury	15 th	03:58	19:09
Venus	1 st	03:23	16:50
Venus	15 th	02:58	17:09
Mars	1 st	03:25	17:23
Mars	15 th	02:51	17:28
Jupiter	1 st	01:32	11:23
Jupiter	15 th	00:38	10:30
Saturn	1 st	12:55	01:24
Saturn	15 th	12:03	01:29

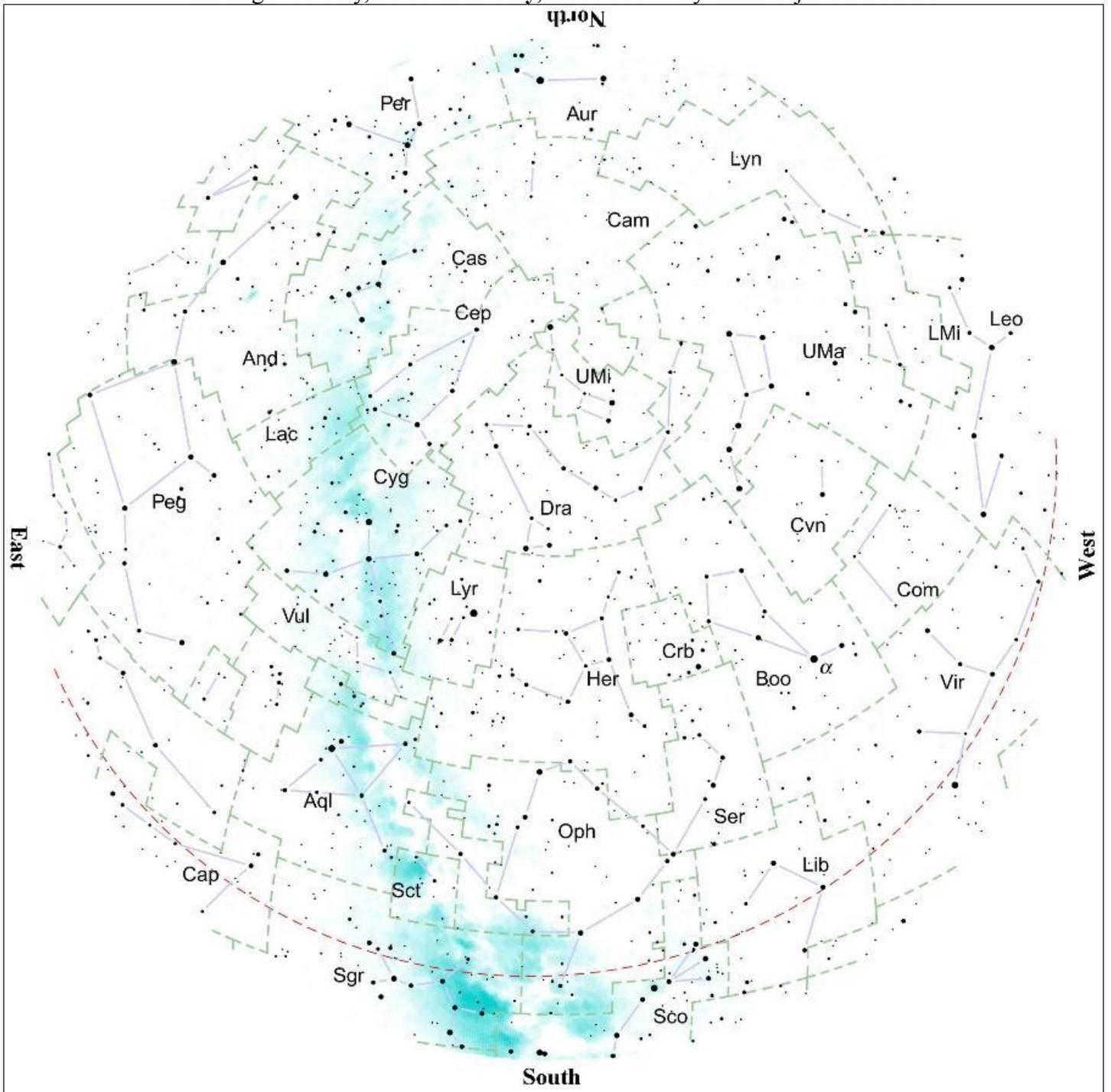
Mercury is visible as a morning object this month, rising higher in the sky by the end of the month.
 Venus rises a good hour and a half before sunrise now passing from Pisces at the beginning of the month through Cetus to Taurus by the end of the month.
 Mars rises just after Venus and moves from Pisces into Aries and is now easily visible before sunrise.
 Jupiter rises well before dawn in the constellation of Aquarius.
 Saturn is visible in the south west after sunset and now sets by midnight by the middle of the month.

The Summer Solstice is on the 21st of June at 05:45. This is the time when the sun is at its farthest north. Any serious observing will take place after midnight.

The June Bootids is a totally unpredictable meteor shower. It is all or nothing. If any activity is going to occur it will be between June the 22nd and July the 2nd. The maximum will occur on June the 27th and the maximum hourly rate will be anything between 0 and 100 meteors plus. If the shower does occur then they will radiate from almost directly overhead.

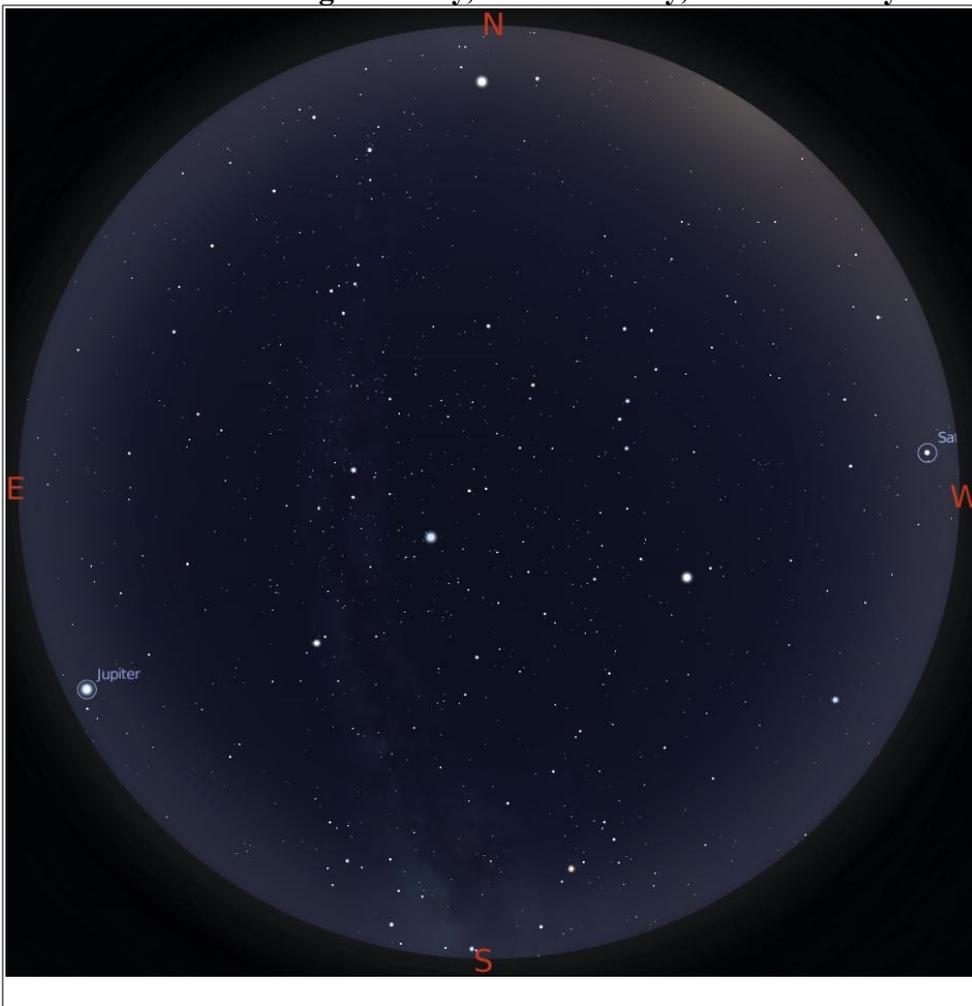
NIGHT SKY JULY

Midnight 1st July, 23:00 15th July, 22:00 31st July. Time adjusted for BST.



NIGHT SKY JULY

Midnight 1st July, 23:00 15th July, 22:00 31st July. Time adjusted for BST.



Sun		Rise	Set
1 st		04:55	21:32
15 th		05:09	21:22
31 st		05:31	21:00
Moon		Rise	Set
1 st		16:17	01:06
15 th		23:53	14:15
31 st		17:37	00:45
New Moon		21st	
First Quarter		28th	
Full Moon		7th	
Last Quarter		15th	
Planet		Rise	Set
Mercury	1 st	03:56	20:22
Mercury	15 th	05:07	21:35
Venus	1 st	02:35	17:39
Venus	15 th	02:23	18:07
Mars	1 st	02:13	17:31
Mars	15 th	01:43	17:32
Jupiter	1 st	23:35	09:24
Jupiter	15 th	10:38	20:23
Saturn	1 st	11:06	00:27
Saturn	15 th	10:17	23:34

Mercury is not visible during July.

Venus rises in Taurus an hour and a half before sunrise and is still a bright object in the sky.

Mars now rises before Venus and is also in the constellation of Taurus.

Jupiter now rises before midnight in the constellation of Aquarius.

Saturn is now low in the sky and near the western horizon after sunset.

Mars and Venus make a splendid view with the Pleiades and Aldebaran from the 11th to the 17th.

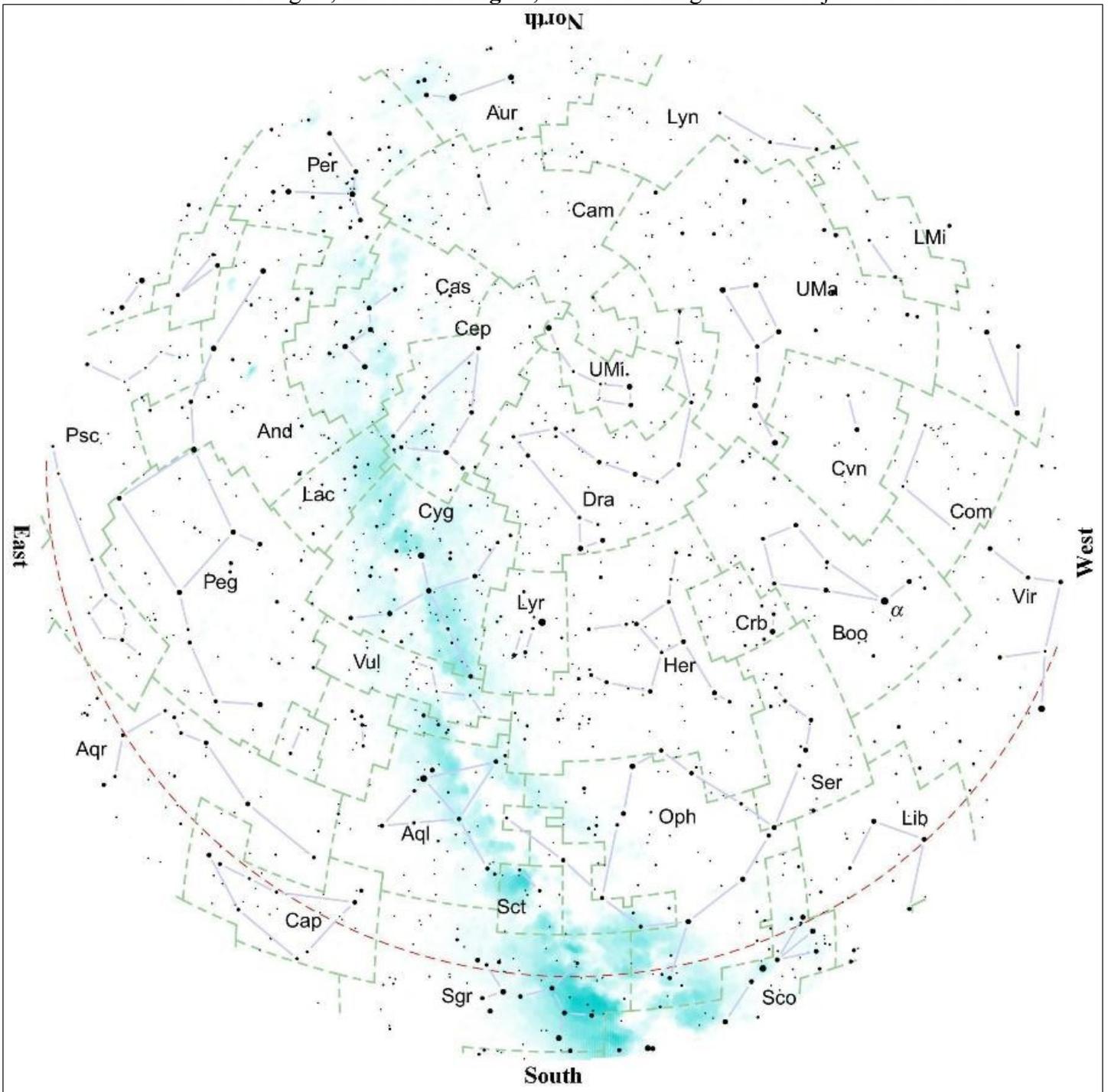
M 13 is known as the Great Globular cluster in Hercules. It should just be visible to the unaided eye on a very dark night and is easily visible in binoculars. M 10 is a dense globular cluster and M 12 is a loosely packed globular cluster. Both are in Ophiuchus and both are visible through binoculars. M 5 in Serpens is a fairly bright globular cluster. With a dark sky it is possible to see it with the unaided eye and is easily seen through binoculars. M 4 in Scorpio is one of the easiest of globular clusters to find. It is visible to the unaided eye on a dark night and very easy to see through binoculars. M 6 and M 7 are both open clusters in Scorpio. Unfortunately they only just rise above the horizon at this latitude so to see them you will need an unobstructed view south with no light pollution.

Constellations best placed for observing are Corona Borealis, Hercules, *Lupus, Ophiuchus, *Scorpio and Serpens.

There are no meteor showers this month.

NIGHT SKY AUGUST

23:00 1st August, 22:00 15th August, 21:00 31st August. Time adjusted for BST.



NIGHT SKY AUGUST

23:00 1st August, 22:00 15th August, 21:00 31st August. Time adjusted for BST.



Sun	Rise	Set	
1 st	05:33	20:58	
15 th	05:55	20:32	
31 st	06:21	19:57	
Moon	Rise	Set	
1 st	18:32	01:36	
15 th	00:21	17:10	
31 st	18:18	01:32	
New Moon	20th		
First Quarter	27th		
Full Moon	6th		
Last Quarter	13th		
Planet	Rise	Set	
Mercury	1 st	07:12	21:45
Mercury	15 th	08:24	21:16
Venus	1 st	02:24	18:36
Venus	15 th	02:41	18:50
Mars	1 st	01:12	17:29
Mars	15 th	00:49	17:21
Jupiter	1 st	09:28	17:05
Jupiter	15 th	20:29	06:00
Saturn	1 st	09:20	22:29
Saturn	15 th	08:33	21:37

Mercury should just be visible after sunset this month.

Venus continues to be a bright morning object rising three hours before sunrise. Venus moves through Gemini and into Cancer this month.

Mars rises about one in the morning moving from Taurus into Gemini.

Jupiter rises just after sunset in the constellation of Capricorn.

Saturn is very low in the west after sunset and will be difficult to see by the end of the month.

M 11 the Wild Duck Cluster in Scutum is a very rich and compact open cluster that is easy to see with binoculars.

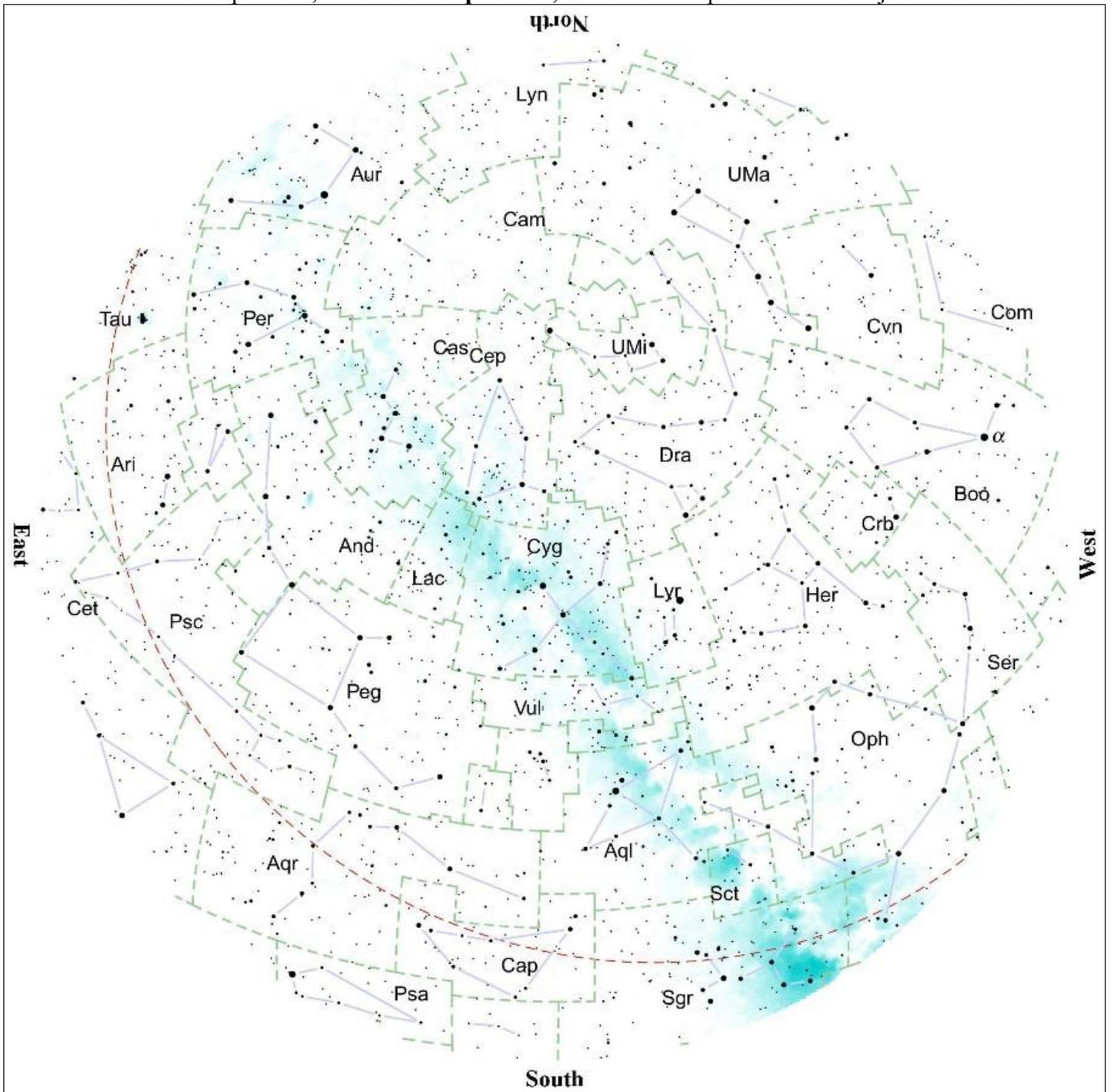
Sagittarius has many easy to see nebulae and clusters, although a good view south is necessary. M 8 the Lagoon nebula is easy to see with binoculars. M 16 the Eagle nebula, is a nebula that also contains an open cluster. It is easy to see with binoculars. M 17 the Omega nebula is easy to see with binoculars and may just be visible with the unaided eye. M 18 is an open cluster easy to see with binoculars. M 22 is the brightest of the globular clusters and was the first one discovered. It can be seen with the unaided eye. M 24 is known as the Sagittarius Star Cloud and is visible to the unaided eye.

Constellations best placed for observing are Lyra, Sagittarius and Scutum.

The Perseid meteor shower is the best known meteor shower. It radiates from the constellation of Perseus. It is active between July 17th and August 24th. At the beginning of August you can expect to see up to 5 meteors an hour. By the 10th this will have risen to about 15 an hour. The maximum is on August 12th where you can expect to see in excess of 100 meteors an hour. This will drop down to about 10 meteors an hour by the 15th then tailing off until the shower ends on the 24th. Unfortunately the moon is badly placed this year and will obscure most meteors between the 11th and the 13th.

NIGHT SKY SEPTEMBER

23:00 1st September, **22:00 15th September**, 21:00 30th September. Time adjusted for BST.



NIGHT SKY SEPTEMBER

23:00 1st September, 22:00 15th September, 21:00 30th September. Time adjusted for BST.



Sun	Rise	Set
1 st	06:23	19:55
15 th	06:45	19:23
30 th	07:09	18:48
Moon	Rise	Set
1 st	18:39	02:41
15 th	02:03	17:49
30 th	17:17	02:48
New Moon	18th	
First Quarter	26th	
Full Moon	4th	
Last Quarter	12th	
Planet	Rise	Set
Mercury	1 st	08:59 20:20
Mercury	15 th	07:58 19:17
Venus	1 st	03:18 18:49
Venus	15 th	03:56 18:36
Mars	1 st	00:27 17:04
Mars	15 th	00:11 16:44
Jupiter	1 st	19:18 04:40
Jupiter	15 th	18:19 03:37
Saturn	1 st	07:38 20:33
Saturn	15 th	06:52 19:41

Mercury is not visible throughout most of September becoming visible just before sunrise at the end of the month.

Venus rises three hours before sunrise at the beginning of the month moving from Cancer into Leo. By the end of the month Venus will be low in the sky before sunrise.

Mars now rises just after midnight still in the constellation of Gemini.

Jupiter is now visible after sunrise but is low in the sky.

Saturn is now difficult to see as it sets in the west half an hour after sunset.

The Autumnal Equinox is on the 22nd of September at 21:18. This is when the sun is directly over the equator, moving from the northern hemisphere to the southern hemisphere.

NGC 7000 the North American Nebula in Cygnus is ideally placed for observation this month. Although it is a large nebula it very faint and so is only visible with binoculars and a dark sky. M 29 in Cygnus is an open cluster visible with binoculars.

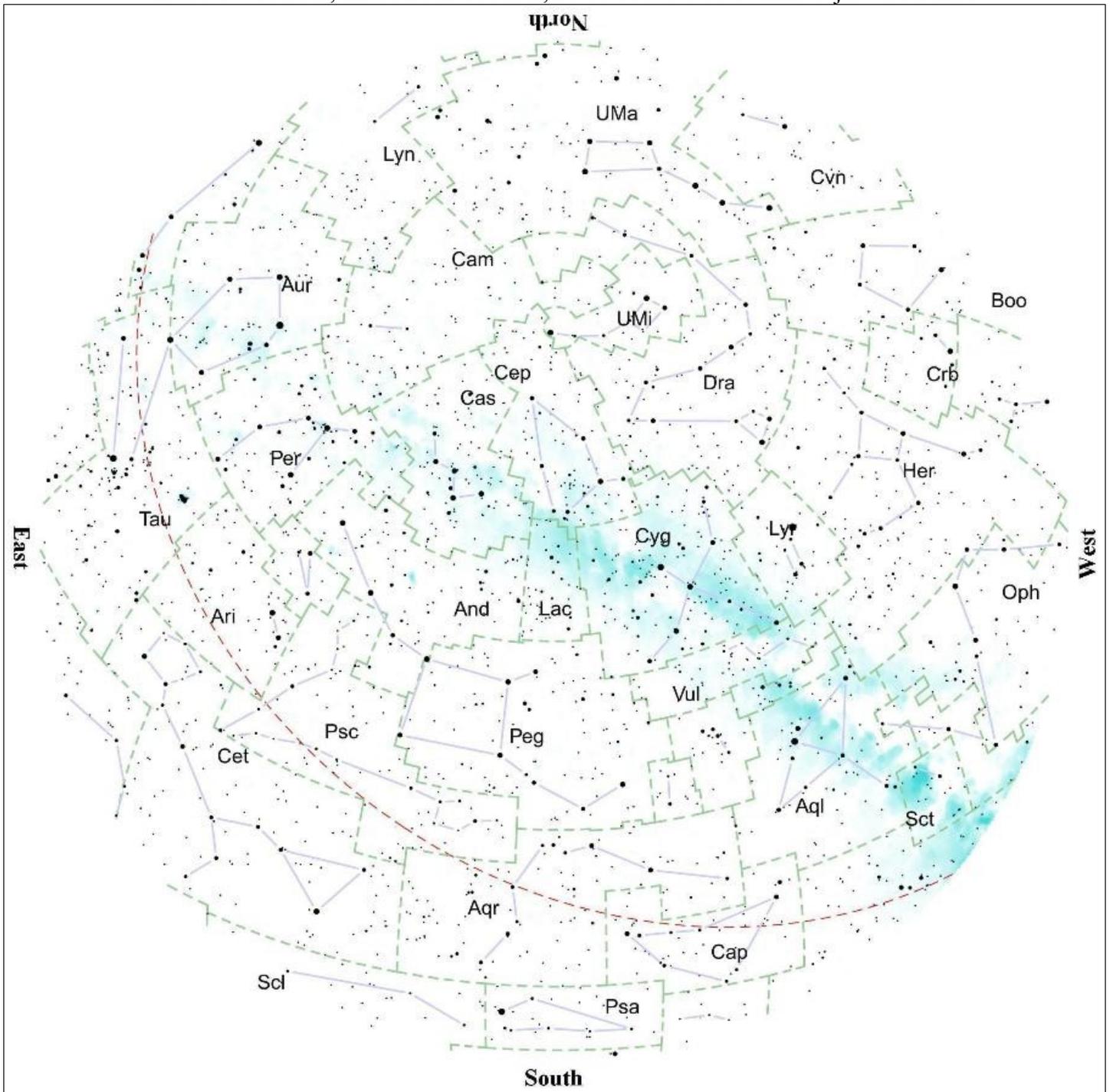
M 27 the Dumbbell nebula in Vulpecula is a fine object to observe through binoculars.

Constellations best placed for observing are Aquila, Cygnus, Sagitta and Vulpecula.

There are no major meteor showers this month.

NIGHT SKY OCTOBER

23:00 1st October, 22:00 15th October, 20:00 31st October. Time adjusted for BST.



NIGHT SKY OCTOBER

23:00 1st October, 22:00 15th October, 20:00 31st October. Time adjusted for BST.



Sun	Rise	Set	
1 st	07:11	18:46	
15 th	07:35	18:14	
31 st	07:03	16:42	
Moon	Rise	Set	
1 st	17:31	03:59	
15 th	04:02	16:49	
31 st	15:19	04:17	
New Moon	18th		
First Quarter	26th		
Full Moon	4th		
Last Quarter	11th		
Planet	Rise	Set	
Mercury	1 st	05:38	18:23
Mercury	15 th	06:06	18:04
Venus	1 st	04:44	18:13
Venus	15 th	05:26	17:49
Mars	1 st	23:54	16:15
Mars	15 th	23:38	15:44
Jupiter	1 st	17:14	02:28
Jupiter	15 th	16:18	01:31
Saturn	1 st	06:01	18:41
Saturn	15 th	05:15	17:49

Mercury should be visible just before sunrise at the beginning of the month.

Venus continues to rise low in the sky before sunrise in the constellation of Virgo.

Mars now rises before midnight and moves from Gemini into Cancer.

Jupiter is visible after sunset in the south and remains low in the sky.

Saturn is now a morning object rising an hour before sunrise.

In the first half of the month it should be possible to see Mercury, Venus and Saturn together just before sunrise.

The clocks go back at the end of this month bringing making observing possible from 18:00

M 15 is a globular cluster in Pegasus. Under perfect viewing conditions it is just visible to the naked eye. With binoculars it is easily seen. M2 is a globular cluster in Aquarius. It is easily seen with binoculars.

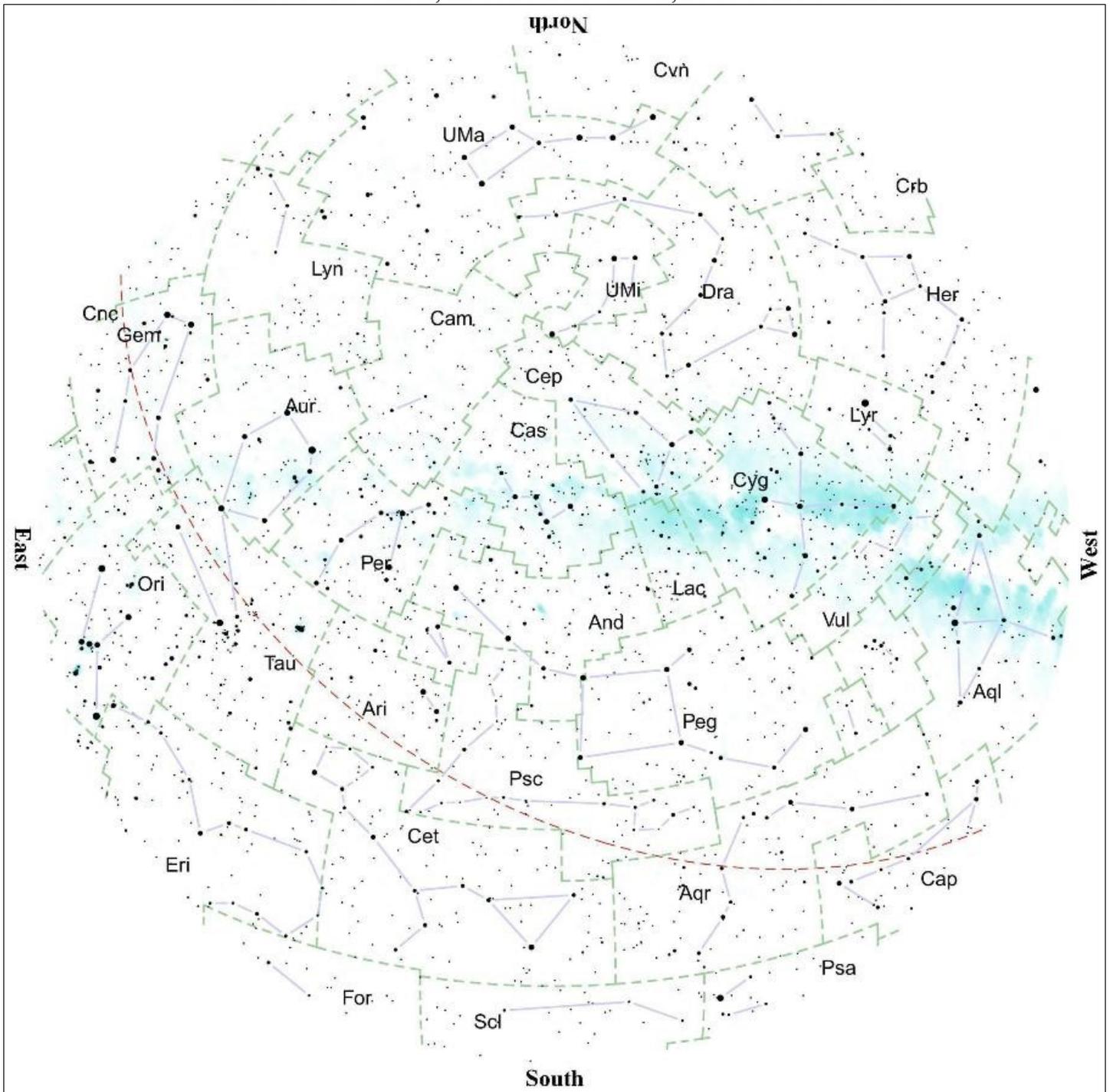
Constellations best placed for observing are Aquarius, Capricornus, Delphinus, Equuleus and *Microscopium.

The Orionids meteor shower is active from October 2nd to November 5th with the maximum occurring on October the 21st. The Orionids can produce some very bright meteors and as the moon sets early in the evening it makes it a shower worth waiting up for. The maximum should produce in excess of 30 meteors an hour.

The Draconids meteor shower is active from October 6th to October 10th with the maximum occurring on October the 8th. Unfortunately the moon is only 4 days past the full so any chance of observing any meteors will be limited to an hour after sunset before moon rise. However as the maximum occurs at 17:40 BST and can occasionally produce hourly rates of 20 – 500 meteors it is quite possible that in that hour after sunset you may be able to observe some slow moving meteors.

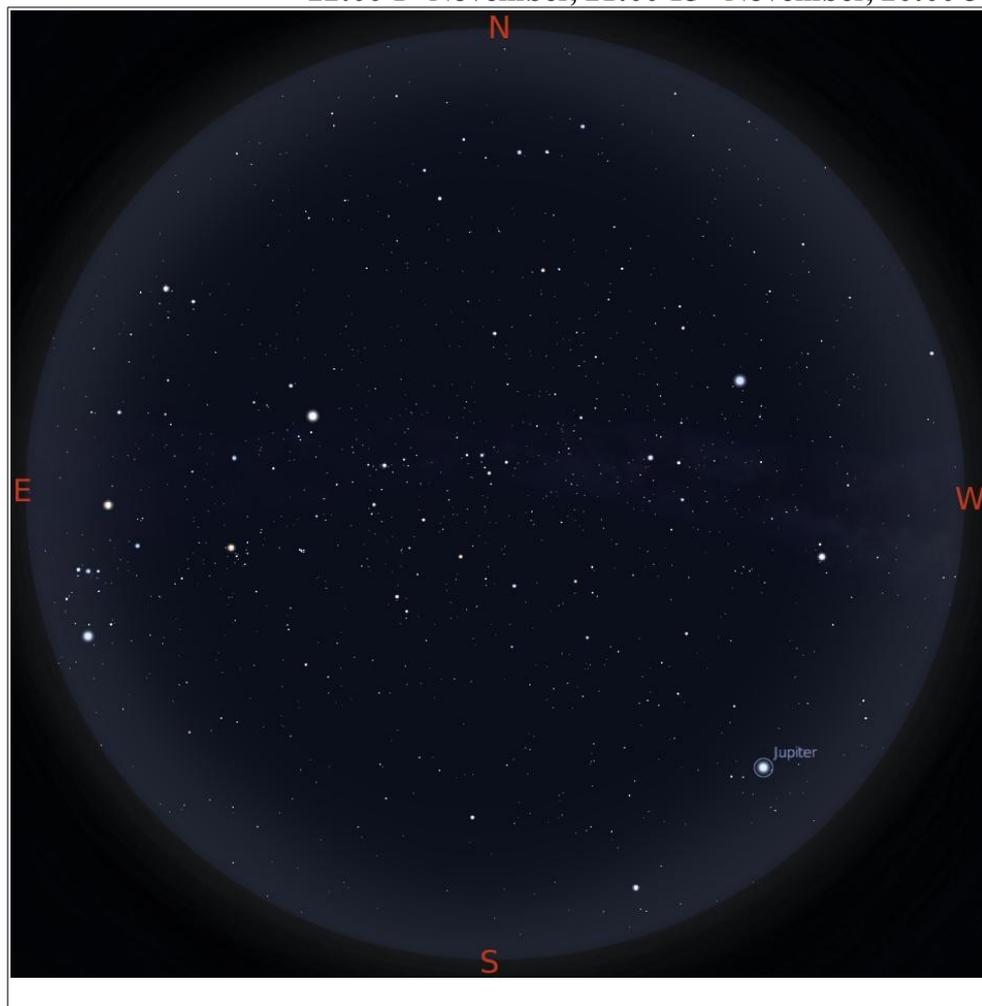
NIGHT SKY NOVEMBER

22:00 1st November, **21:00 15th November**, 20:00 30th November.



NIGHT SKY NOVEMBER

22:00 1st November, 21:00 15th November, 20:00 30th November.



Sun	Rise	Set	
1 st	07:05	16:40	
15 th	07:30	16:17	
30 th	07:54	16:02	
Moon	Rise	Set	
1 st	15:37	05:33	
15 th	06:08	15:07	
30 th	14:25	05:47	
New Moon	16th		
First Quarter	24th		
Full Moon	2nd		
Last Quarter	9th		
Planet	Rise	Set	
Mercury	1 st	06:45	16:42
Mercury	15 th	08:04	16:29
Venus	1 st	05:19	16:18
Venus	15 th	06:04	15:56
Mars	1 st	22:14	14:02
Mars	15 th	21:49	13:22
Jupiter	1 st	14:12	23:28
Jupiter	15 th	13:19	22:39
Saturn	1 st	03:19	15:45
Saturn	15 th	02:31	14:53

Mercury is not visible this month.

Venus continues to rise just before the Sun as it moves through Virgo into Libra. By the end of the month Venus will be difficult to see.

Mars rises late in the evening in the constellation of Cancer. On the first of the month Mars is in M 44 Praesepe the Bee Hive Cluster

Jupiter is visible after sunset low in the southern sky and sets by 22:30.

Saturn rises in the east in the constellation of Virgo four hours before sunrise.

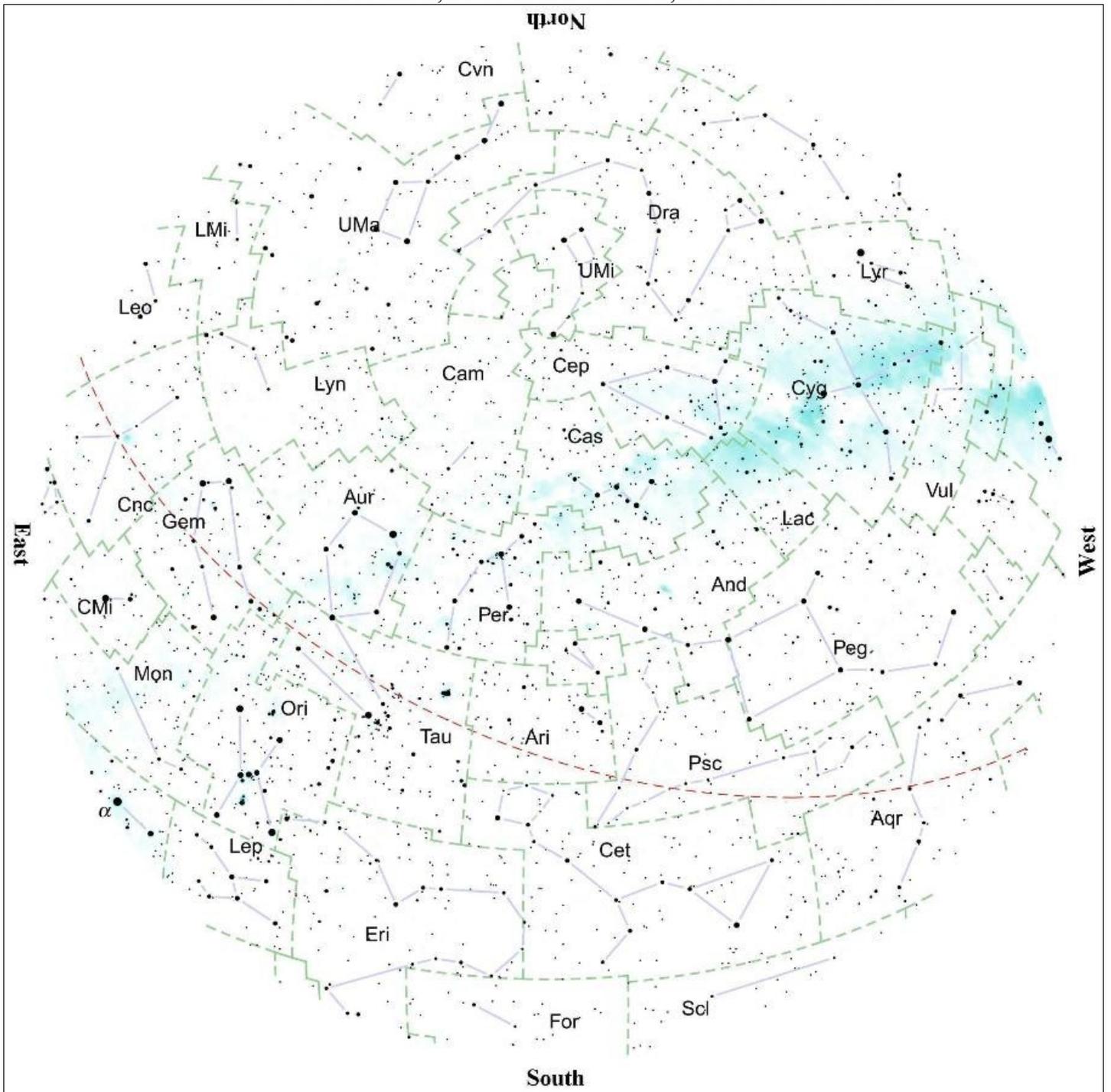
M31 the Andromeda Nebula is best placed for observing this month. With the cold evenings and M31 being high in the night sky it is the best chance to see it with the unaided eye. If this proves impossible due to light pollution at your location then it should still be visible through binoculars.

Constellations best placed for observing are Pegasus, Pisces, Piscis Austrinus and *Sculptor.

The Leonids can be the strongest meteor shower of the year and has produced some of the most spectacular meteor showers in history. The shower is active from the 10th to the 23rd of November with the maximum occurring on the 17th. This year between 21:00 – 22:00 on the 17th there is a chance of a meteor storm with the rate very briefly reaching 1000 – 1500 meteors an hour. For me personally this is my favourite shower. I have seen a few fireballs in my time but at about 04:00 on the 19th of November 2002 I observed a brilliant emerald green fireball that has so far surpassed any fireballs I have ever seen.

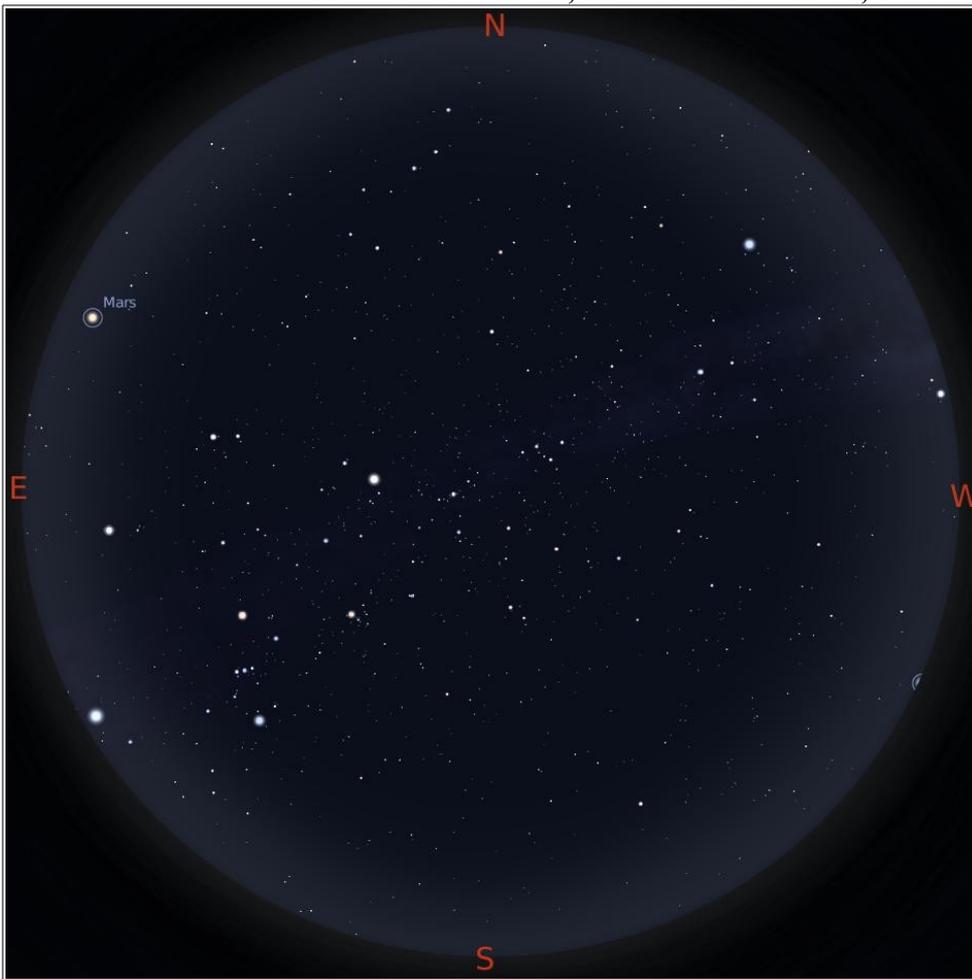
NIGHT SKY DECEMBER

22:00 1st December, 21:00 15th December, 20:00 31st December.



NIGHT SKY DECEMBER

22:00 1st December, 21:00 15th December, 20:00 31st December.



Sun	Rise	Set
1 st	07:55	16:01
15 th	08:11	15:58
31 st	08:17	16:08
Moon	Rise	Set
1 st	15:01	07:08
15 th	07:32	14:51
31 st	15:47	08:07
New Moon	16th	
First Quarter	24th	
Full Moon	2nd 31st	
Last Quarter	9th	
Planet	Rise	Set
Mercury	1 st	09:18 14:38
Mercury	15 th	09:47 17:15
Venus	1 st	06:55 15:39
Venus	15 th	07:35 15:36
Mars	1 st	21:11 12:33
Mars	15 th	20:26 11:46
Jupiter	1 st	12:20 21:48
Jupiter	15 th	11:30 21:06
Saturn	1 st	01:36 13:52
Saturn	15 th	00:45 12:59

Mercury is just visible after sunset in the later half of the month.

Venus is not visible this month.

Mars is moving into the constellation of Leo and is rising before 21:00.

Jupiter is visible after sunset low in the sky towards the south west.

Saturn rises shortly after midnight in the east.

The Winter Solstice is on the 21st of December at 23:38. This is the time when the sun is at its farthest south.

Also this month we have a Blue Moon. This rare event happens when you have two full moons in one calendar month.

M 33 is a spiral galaxy in Triangulum. Under perfect viewing conditions it is just visible to the unaided eye.

NGC 869 and NGC 884 are known as the Double Cluster in Perseus. They are visible to the unaided eye.

Melotte 20 is also known as the Alpha Persei Star Cluster. It makes a fine object to observe through binoculars.

M 34 is an open cluster in Perseus. It is just visible to the unaided eye and easily seen through binoculars.

Constellations best placed for observing are Andromeda, Aries, Cassiopeia, Cetus and Triangulum.

The Geminids are considered to be the most reliable of all the meteor showers. It radiates from the constellation of Gemini and is active between the 7th and 17th of December. Its maximum is on the 14th where the hourly rate can be between 60 and 120 meteors, sometimes even more.

The Ursids radiate just below β Ursa Minor and are active between the 17th and the 26th of December with the maximum occurring on the 22nd. The maximum rate is normally 10 meteors an hour but very occasionally have been known to have bursts of up to 100 an hour.

STAR ATLAS

Chart 1. Dec +50 to +90

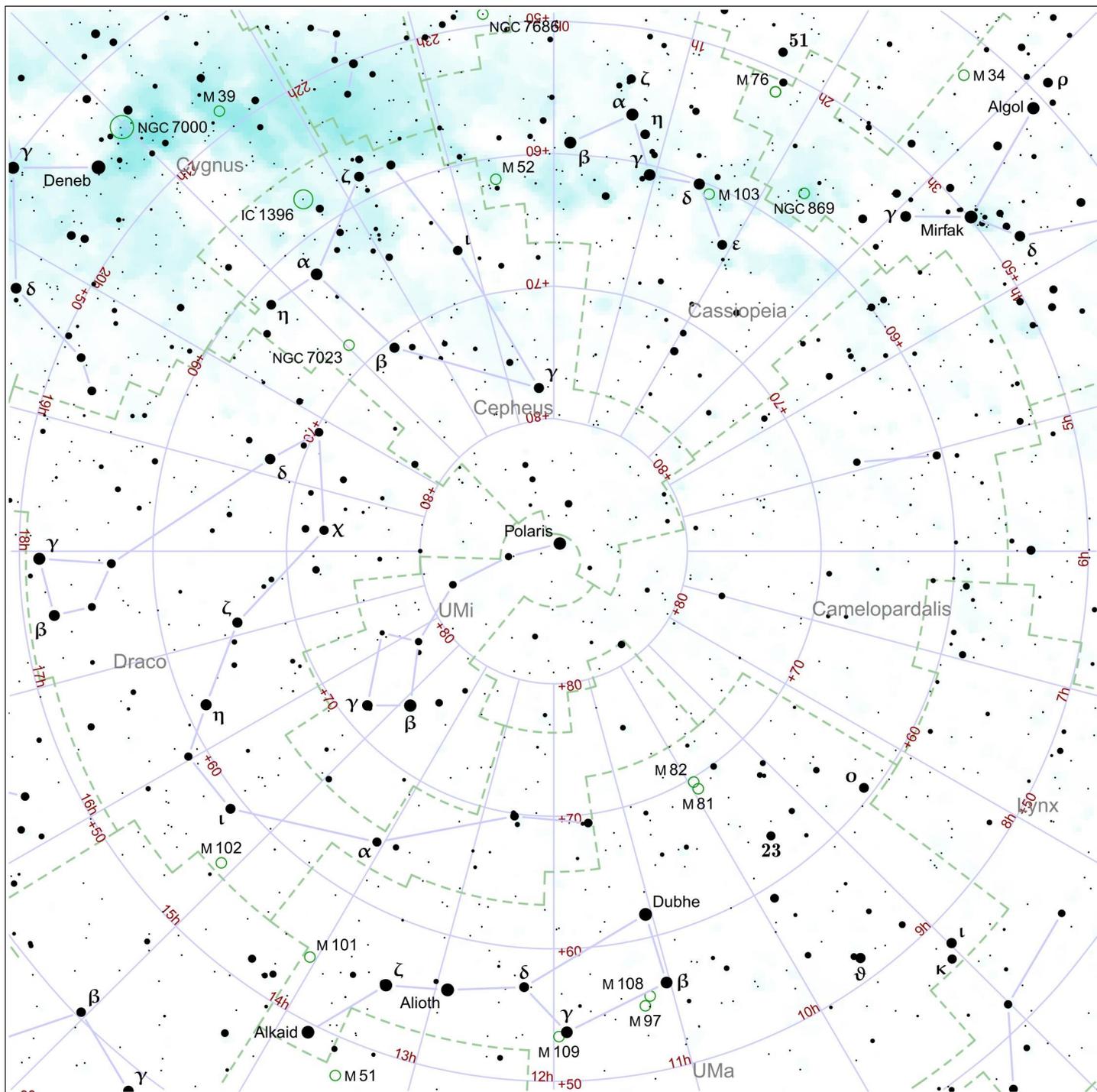


Chart 2. RA 0h to 4h. Dec -50 to +50

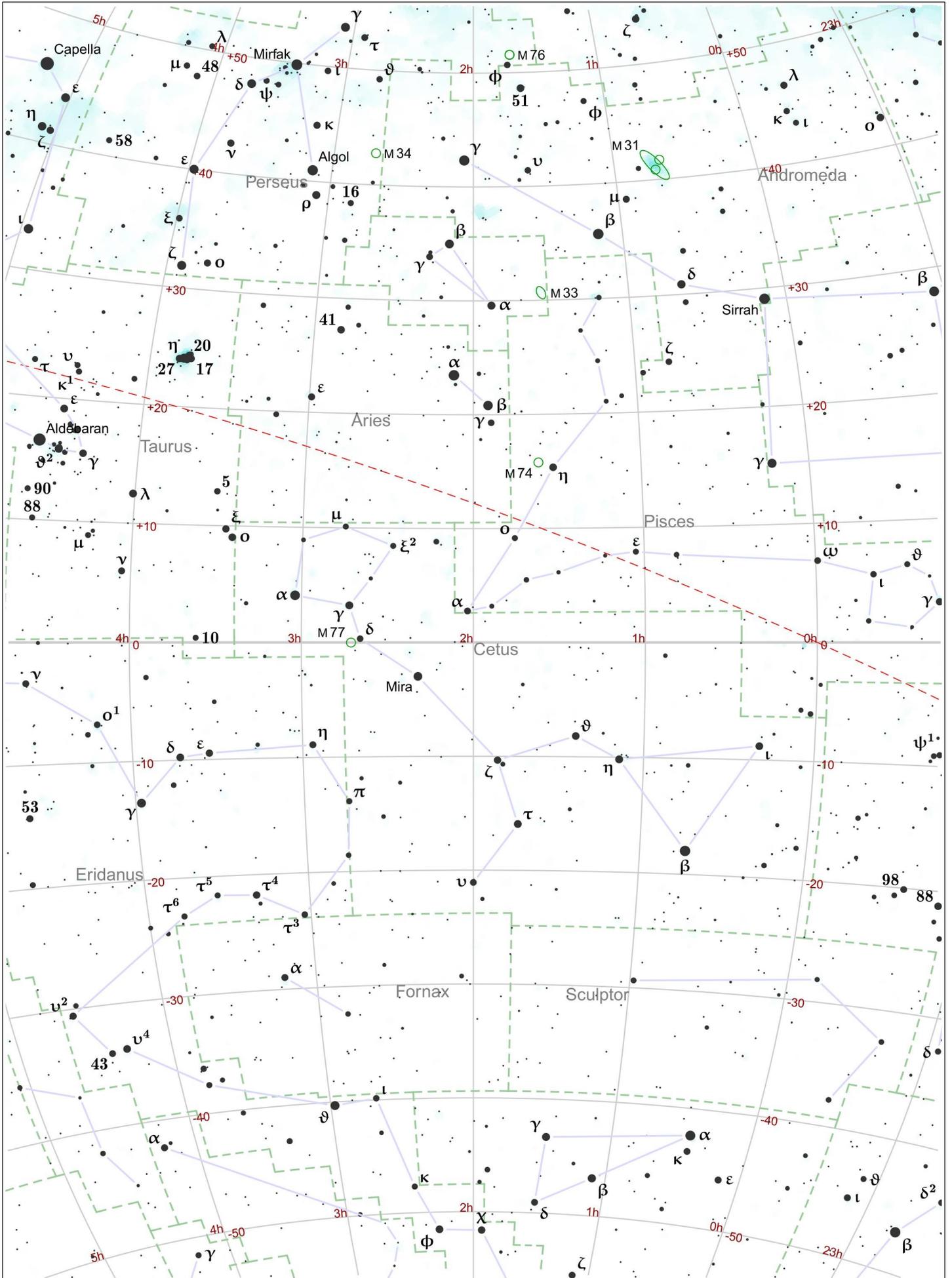


Chart 3. RA 4h to 8h. Dec -50 to +50

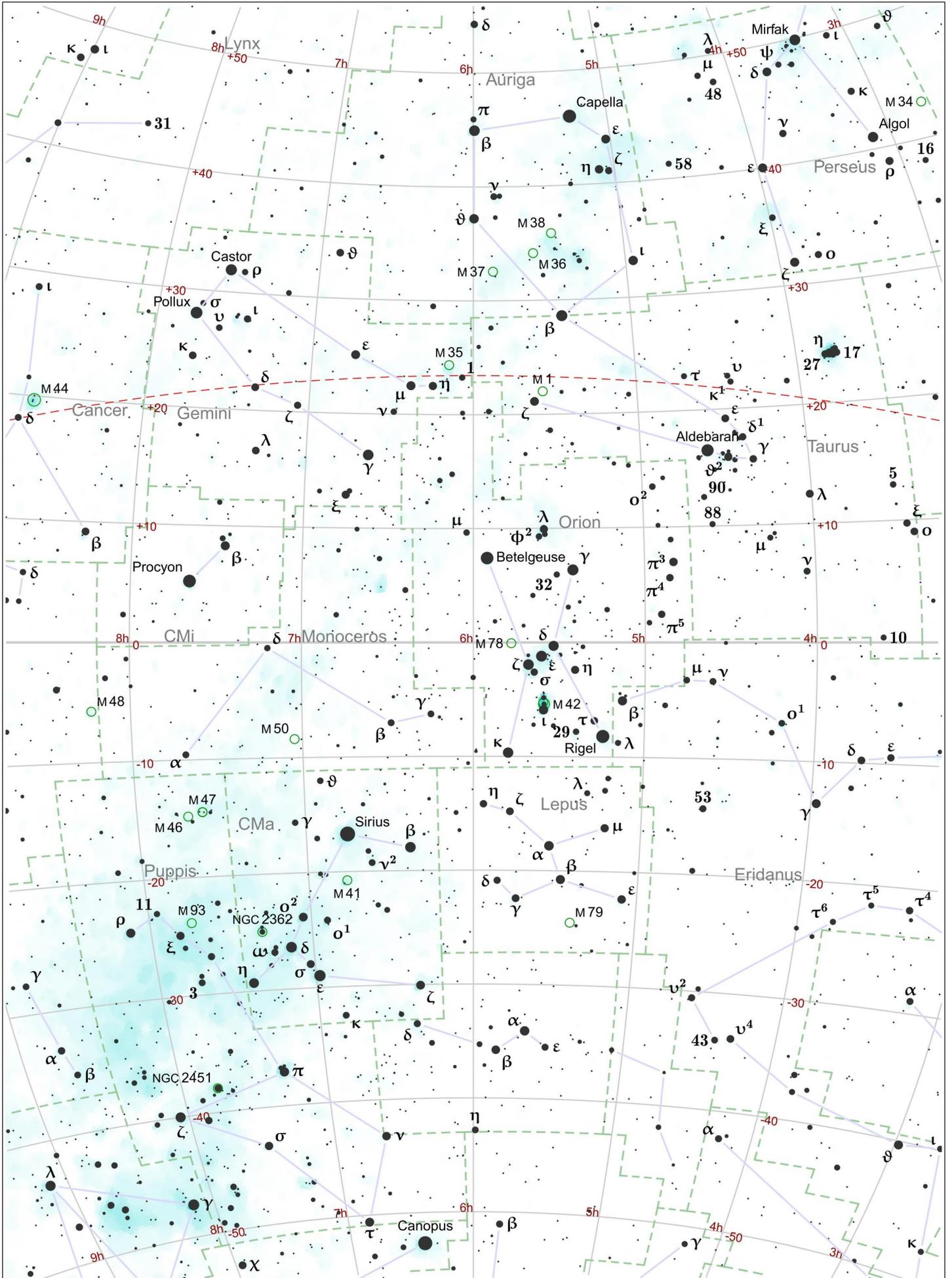


Chart 5. RA 12h to 16h. Dec -50 to +50

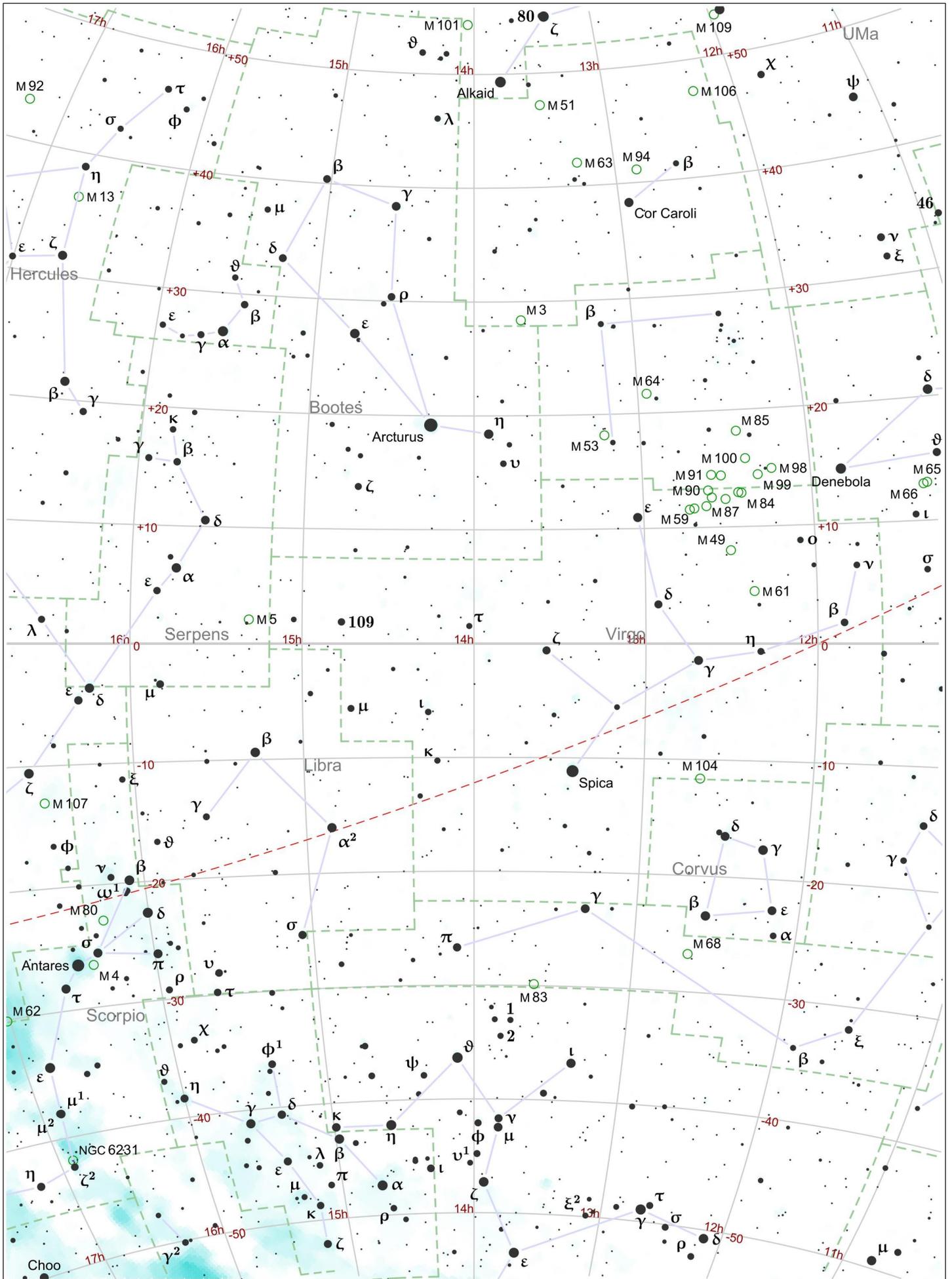


Chart 6. RA 16h to 20h. Dec -50 to +50

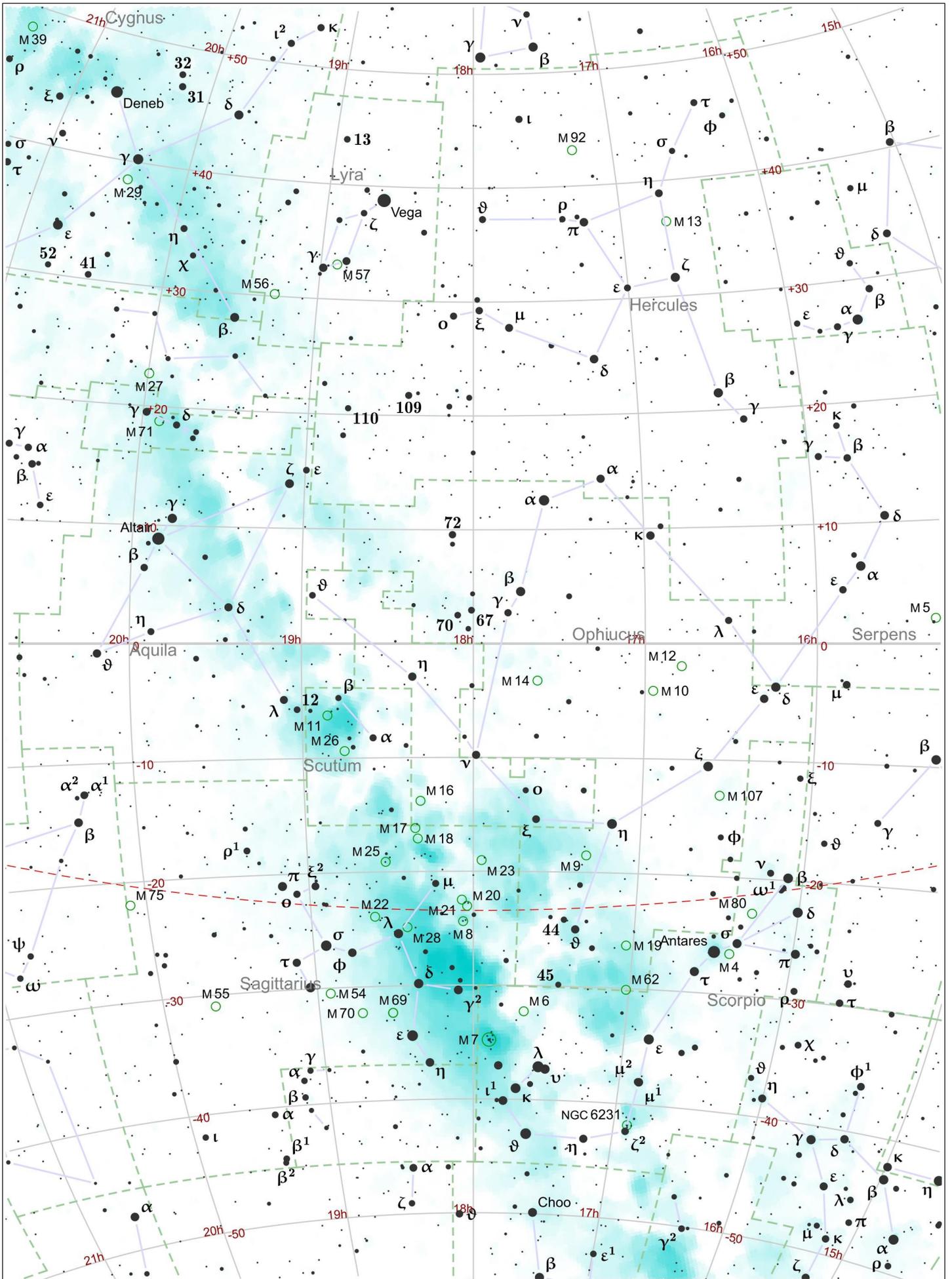


Chart 7. RA 20h to 0h. Dec -50 to +50

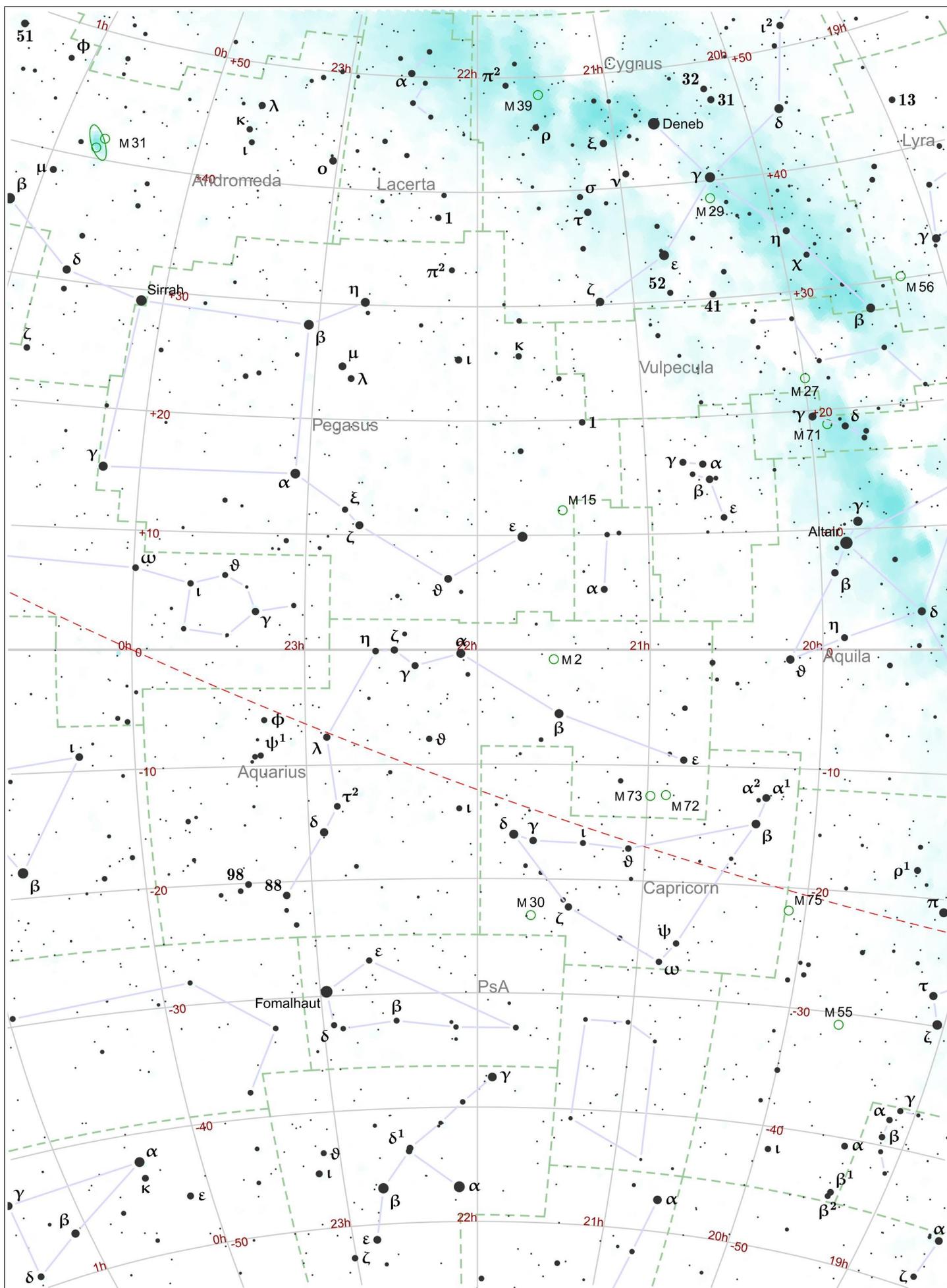


Chart 8. Dec -50 to -90

