

MONTHLY OBSERVER'S CHALLENGE

Las Vegas Astronomical Society

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&

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JUNE 2013

NGC-5466 Globular Cluster In Boötes

Introduction

The purpose of the observer's challenge is to encourage the pursuit of visual observing. It is open to everyone that is interested, and if you are able to contribute notes, drawings, or photographs, we will be happy to include them in our monthly summary. Observing is not only a pleasure, but an art. With the main focus of amateur astronomy on astrophotography, many times people tend to forget how it was in the days before cameras, clock drives, and GOTO. Astronomy depended on what was seen through the eyepiece. Not only did it satisfy an innate curiosity, but it allowed the first astronomers to discover the beauty and the wonderment of the night sky.

Before photography, all observations depended on what the astronomer saw in the eyepiece, and how they recorded their observations. This was done through notes and drawings and that is the tradition we are stressing in the observers challenge. By combining our visual observations with our drawings, and sometimes, astrophotography (from those with the equipment and talent to do so), we get a unique understanding of what it is like to look through an eyepiece, and to see what is really there. The hope is that you will read through these notes and become inspired to take more time at the eyepiece studying each object, and looking for those subtle details that you might never have noticed before. Each new discovery increases one's appreciation of the skies above us. It is our firm belief that careful observing can improve your visual acuity to a much higher level that just might allow you to add inches to your telescope. Please consider this at your next observing session, as you can learn to make details jump out. It is also a thrill to point out details a new observer wouldn't even know to look for in that very faint galaxy, star cluster, nebula, or planet.

NGC-5466 Globular Cluster In Boötes

NGC-5466 is a globular cluster in the constellation of Boötes. It was discovered by William Herschel on May 17, 1784 and is a class XII globular, meaning, it is the least dense with a class I being the densest. It lies about 51,800 light years from Earth and around 52,800 light years from the galactic center.

The globular has unusual properties in that it contains a horizontal branch of blue stars as well as being the source of a stellar stream that extends from Boötes to Ursa Major. It's a nice surprise when finally spotted, as there are several bright foreground stars as well as the foggy haze of the body of the cluster in the background. It isn't hard to resolve with larger apertures due to its' relatively thin density.

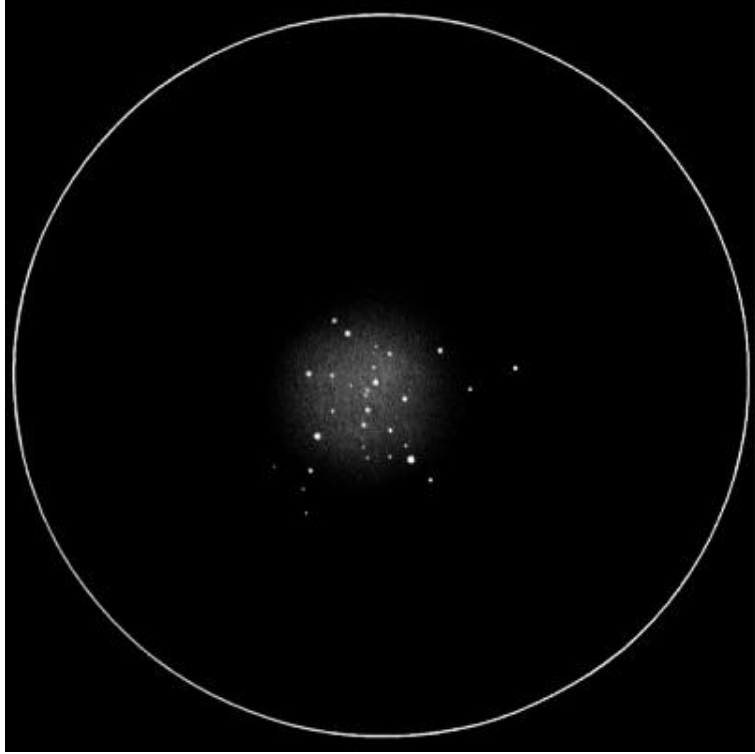
Observations/Drawings/Photos

Jaakko Saloranta: Observer from Finland

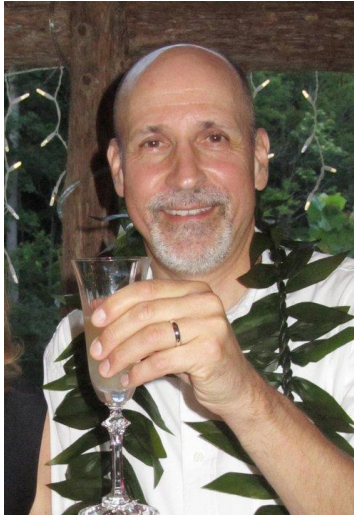


The sketch is from 2007 and represents NGC-5466 as seen through an 8 inch (20 centimeters) Dobsonian at a magnification of 190X under suburban skies. Naked-eye limiting mag. was roughly 5.2 and the sky conditions were average at best. Weather conditions were as follows: 17°F, humidity ~69%, SW wind 3.1 m/s and air pressure at 1017 hPa. Under such conditions, the object was fairly difficult to see, but I've been able to log it with a pair of 8X30 binoculars under dark, high-altitude skies. With the Dobsonian, I wrote a simple description: "Somewhat resolved from the edges and low surface brightness, thus nearly lost in the light-polluted background sky. Two mag. 13 stars in the SE and SW edges, being probably not part of the cluster. The center is only marginally brighter. ~30 stars resolved around mag. 14 and beyond. Faint N-S arc visible W from the center."

My H-400 notes from 2012 describe the cluster as barely visible under more light polluted skies: "@ 100X, was extremely faint, visible only occasionally with optimal averted vision. Round, barely concentrated toward the center. No individual stars visible. Not found using Uranometria - too faint. Altitude of the object was 48°. Not seen the night before under slightly poorer conditions." I was using the same 8-inch Dobsonian. Telescopic limiting mag. in the region was roughly 13.2 while the NELM was 5.3 (SQM-L 18.70). Conditions were poor due to faint cirrus clouds passing by in Boötes and partial snow cover.



James Dire: Observer from Hawaii



NGC-5466 is an excellent globular star cluster located in the constellation Boötes. It lies 9.5° north and 2° west of the bright star Arcturus. The cluster shines at mag. 9.3 and is 11 arc minutes in diameter.

It is the only star cluster of note in the entire constellation. However, this globular cluster is often overlooked since the brighter globular cluster M-3 lies 5° to its west. M-3 is three mags. brighter and considerably larger than NGC-5466.

NGC-5466 was discovered on May 17, 1784 by the famous English astronomer William Herschel. The cluster lies just under 52,000 light years away, in the halo of the Milky Way.

It is unusual for a globular cluster as it has a horizontal branch of blue stars when the stars were plotted on a Hertzsprung-Russell diagram. The cluster is also losing stars to the Milky Way as it passes close to the galaxy during its elliptical orbit. It is thought to have lost 60% of its stellar mass during its existence and is the source of a lane of stars 1.4° wide extending from Boötes to Ursa Major.

My image was taken June 3, 2013 with a 102mm (4-inch) f6.9 refractor using an SBIG ST-2000XCM CCD camera. The exposure was 10 minutes. In the image, north is up and west is to the right.

The bright star to east-southeast of the cluster in my image is mag. 6.9 SAO 83172. The star appears 20 arc minutes away from the center of the cluster, but it really resides only ten percent as far away. The faintest stars in the image are mag. 17.

The arrow in the image points to galaxy PGC-50187, a mag. 15.5 spiral galaxy measuring 43×20 arc seconds in size. The galaxy lies 561 light years away.



Gus Johnson: Observer from Maryland



In April, 1967, from Pennsylvania, the NELM was 5.0.

With a 6-inch reflector at 59X, NGC-5466 appeared very faint and evenly illuminated. There was no resolution of individual stars and the shape was mostly round.

Rob Lambert: Observer from Nevada



I observed NGC-5466 on Saturday, June 15, 2013 during a public Astronomy-in-the-Park at the Las Vegas Ski and Snowboard Resort near Mt. Charleston in Las Vegas, NV. Equipment used included my 5-inch Apochromatic refractor, Mallincam VSS+ with a .5 focal reducer, all sitting on an Orion Atlas EQ-G equatorial mount. Effective magnification was 60X. Darn it – I forgot my video capture device. Thought it was in the video box, but no bingo. I had to take a shot off the monitor with my iPhone. This is about the worst photo I could ever hope to produce.

While observing this object, several public visitors were commenting that they saw a sea turtle in the pattern of stars. It takes some imagination, but then again, if astronomers have anything, it's an imagination. The turtle is in the middle of the photo, the greater part of the cluster being his body. There are two little juts of stars at bottom center that are his rear flippers and there are two strings of stars extending away from the top of the cluster that are his larger front flippers. His head is the pentagon of stars above the main cluster. I think we'll have to christen this cluster the "Sea Turtle" cluster.

I resolved about 30 brighter stars in the midst of the cluster and at least double that in dimmer stars that I could make out. There are obviously hundreds, even thousands of stars in the cluster that I couldn't resolve in this image of an image. (You try holding an iPhone still enough to capture a low-light image while you're shivering from the cold! I captured this image at the end of the evening, after the temp had dropped to below 40°.) There are a number of star chains outside of the cluster, extending in various directions. Two of the chains form a "V" below and left of the cluster that opens down and to the right. Another longer chain is located above and right of the cluster. Visually, quite a number of the brighter stars in the cluster had a yellowish tint. This yellowish tint didn't come out in the image. These yellowish stars were the larger "blobulous" stars in the image.

Since NGC-5466 will still be positioned well during the next month, I'll get my act together and capture a true Mallincam image of it the next time I go out.

Editors note: Since he wrote this report, there was a major fire in the mountains to the south of this location and the resulting evacuation of the area and resultant smoke in and around Las Vegas along with clouds made further observations anywhere close by during the opportune timeframe impossible.



Jim Gianoulakis: Observer from Nevada



NGC-5466 is a globular cluster in the constellation Boötes. It's located 51,800 light years from Earth and 52,800 light years from the Galactic center. The cluster was discovered by William Herschel on May 17, 1784. This globular cluster is unusual insofar as it contains a horizontal branch of blue stars. It's also unusual in that it's comprised of unusually metal-poor stars unlike like ordinary globular clusters. The cluster is also unusual from the perspective that a tidal stream, as detected from images of the Sloan Sky Survey, has been associated to it. I don't have an understanding of the implications of this discovery, so have included some information for further study concerning this subject. Perhaps some of our resident astronomers may be able to explain the significance of this tidal involvement.

This is an excerpt from *The Astrophysical Journal*, March 1, 2006:

The Detection of a 45° Tidal Stream Associated with the Globular Cluster NGC-5466

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ABSTRACT

We report on the detection in Sloan Digital Sky Survey data of a 45° tidal stream of stars, extending from Boötes to Ursa Major, which we associate with the halo of globular cluster NGC-5466. Using an optimal contrast, matched-filter technique, we find a long, almost linear stellar stream with an average width of 1.4. The stream is an order of magnitude more tenuous than the stream associated with Palomar 5. The stream's orientation on the sky is consistent to a greater or lesser extent with existing proper-motion measurements for the cluster.

Subject headings: Galaxy: halo; Galaxy: structure; globular clusters: general; globular clusters: individual (NGC-5272, NGC-5466)

1. Spitzer Graduate Student Fellow.

1. INTRODUCTION

Since the advent of large-scale, digital sky surveys, we have seen a remarkable increase in our ability to distinguish substructures in our Galaxy (Yanny et al. 2003; Majewski et al. 2003; Rocha-Pinto et al. 2004; Johnston et al. 2005). Among the first discoveries in the Sloan Digital Sky Survey (SDSS) data were the remarkably strong tidal tails of Palomar 5 (Odenkirchen et al. 2001; Rockosi et al. 2002; Odenkirchen et al. 2003), spanning over 10° on the sky. Tidal tails of globular clusters are particularly interesting from a dynamical standpoint as they are expected to be very cold (Combes et al. 1999). This makes them potentially useful for constraining not only the global mass distribution of the Galaxy but also its lumpiness (Murali & Dubinski 1999).

Globular cluster tidal tails were first discovered in a photographic survey of 12 southern halo clusters by Grillmair et al. (1995). Leon et al. (2000) and subsequent workers found similar evidence for tidal tails in over 30 other Galactic globular clusters. Once the characteristic, power-law departure at large radius from a King profile was recognized as a signature of unbound stars, evidence of tidal tails was detected in globular clusters as far away as the halo of M-31 (Grillmair et al. 1996).

NGC-5466 is an interesting globular cluster in many respects. It has a blue horizontal branch and a large, centrally concentrated distribution of blue stragglers (Nemec & Harris 1987). On the other hand, like Pal 5, NGC-5466 is a low-metallicity ($[Fe/H] = -2.22$), low-mass, and low-concentration cluster. Pryor et al. (1991) determined a very low $(M/LV)_0 = 1 \pm 0.4$ for this cluster and suggested that it must have lost a significant fraction of its low-mass stars. Combining these factors with NGC-5466's putative orbit, Gnedin & Ostriker (1997) ranked it among globular clusters most likely to have suffered substantial tidal stripping over time. Evidence for the existence of unbound stars around NGC-5466 was first presented by Lehmann & Scholtz (1997). Odenkirchen & Grebel (2004) examined the spatial distribution of cluster member candidates within a degree of NGC-5466 using APM data. Most recently, Belokurov et al. (2005) used SDSS photometry to discover a tidal stream extending 2° from NGC-5466 on either side.



Jay and Liz Thompson: Observers from Nevada



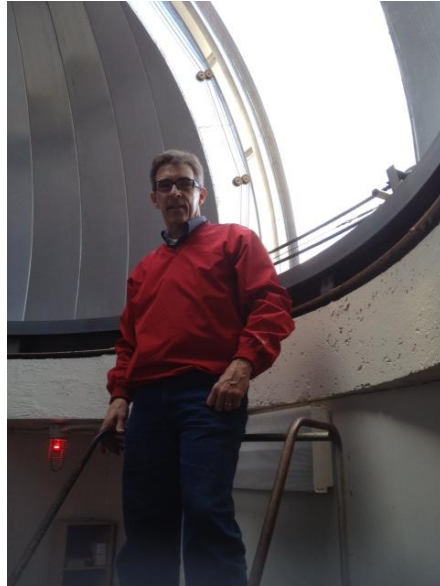
We observed NGC-5466 from our back yard in Henderson, NV on May 17, 2013 with a 14-inch f/11 SCT. Although there was some interference from the first quarter Moon, we felt it was worth a try.

NGC-5466 is close to the much brighter M-3 (we star-hopped from M-3 to NGC-5466). Of additional interest is the pair of globular clusters M-53 and NGC-5053 that are close by. We observed all four globular clusters. NGC-5466 is slightly brighter and easier to see than NGC-5053, and about the same apparent diameter. M-53 is next brightest and M-3 the brightest.

Using a 14mm eyepiece (279X), NGC-5466 was seen initially as a slight glow. Upon further study using a hood to block out extraneous light, as well as averted vision, we resolved a couple dozen stars in the background glow of the cluster. We had similar impressions under moonless skies from our back yard on May 29, 2013 and May 31, 2013.

On June 7, 2013, Jay observed NGC-5466 from Meadview, AZ using his 17.5-inch f/4.5 Newtonian. I star-hopped from M-3 to nearby NGC-5466. NGC-5466 was obvious in a 16mm eyepiece (125X), with dozens of stars visible. Using an 8.8mm wide-field eyepiece, giving 227X, the cluster resolved well, with dozens of stars visible with direct vision. For comparison, I next viewed the globular pair M-53 and NGC-5053. NGC-5053 appeared comparable in size but dimmer than NGC-5466. Only about a dozen stars were visible in NGC-5053 using direct vision. I used the black cloth observing hood for observations of these two dim globulars.

Roger Ivester: Observer from North Carolina



On June 11, 2013, I observed NGC-5466 from my moderately polluted backyard in the western foothills of North Carolina. The seeing and transparency were excellent and the NELM was 5.2. I used a 10-inch f/4.5 reflector and various magnifications.

This is a very low surface-brightness globular cluster. Easy to see at 57X, it appeared as a mostly round, faint haze of unresolved stars. This globular is located a few minutes SW of a mag. 7 star. When increasing the magnification to 104X, I counted approximately fifteen faint stars when using averted vision. The shape of the cluster at the higher magnification became a bit more irregular, but the many faint background stars continued to present an unresolved haze. Overall, the cluster was easy to see at both low and medium magnification. It should be noted however, that two nights earlier, with very high humidity and poor transparency, I couldn't see the cluster at all, using the same telescope.

NGC 5466 - Globular Cluster - Boötes

Date: June 11th 2013

Location: Backyard - NEEM 5.2

Telescope: 10-Inch Reflector

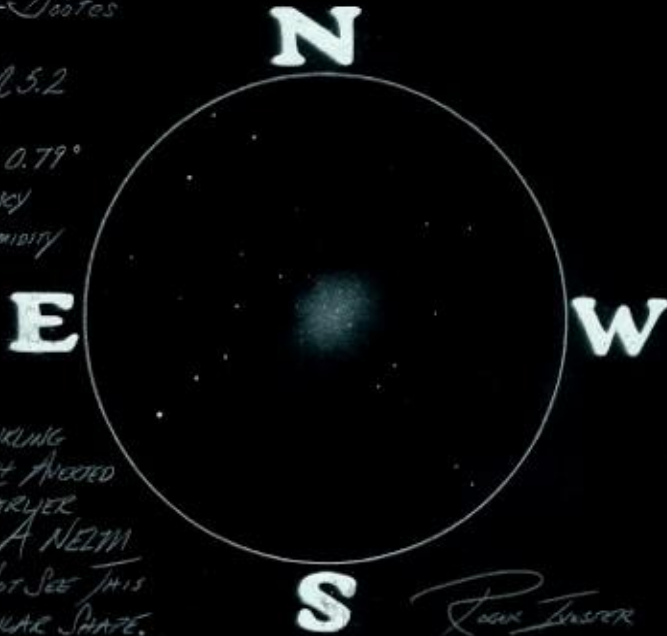
Eye Piece: 11mm - 104X - 0.79°

Excellent Seeing + Transparency

Temp: Low 60's - 58% Humidity

Description:

Easy to see @ 5TX,
Even with moon in the
Western trees. After
moonset, could see a sprinkling
of quite a few stars with angled
vision. Several nights earlier
with high humidity and a NEEM
of 4.5 or less, could not see this
globular at all. Irregular shape.



Roger Janssen

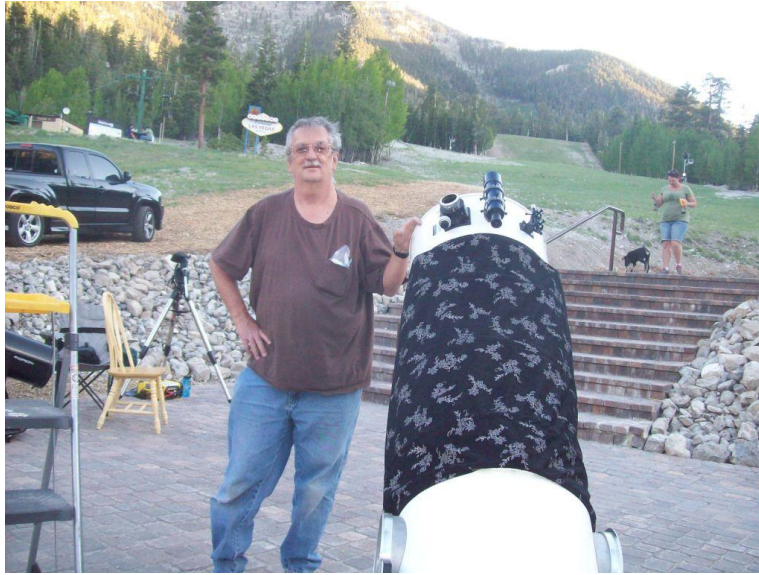
Debbie Ivester: Observer from North Carolina



On June 11, 2013, I observed NGC-5466 from my moderately polluted backyard in the western foothills of North Carolina. The seeing and transparency were excellent and the NELM was 5.2. I used a 10-inch f/4.5 reflector and a magnification of 104X.

When using the 10-inch, I could see the globular cluster at 104X, but with difficulty. I could see only a few of the brighter members, using averted vision. The shape was mostly round, and I did notice one brighter star, very close to the cluster. This object seemed really dim to me, and again, fairly difficult.

Fred Rayworth: Observer from Nevada



The first time I observed NGC-5466 was from the Redstone Picnic Area on the North Shore Road of Lake Mead on April 29, 2006. With an altitude of 2,100 feet, it was warm and calm. It looked like it was going to be good and it turned out to be a great night. There was just a sliver of moon and the skyglow from Las Vegas was not too bad. As the night progressed, there was a little breeze but not enough to affect anything. That night, I used my home-made 16-inch f/6.4 Dobsonian at 70X.

All I saw was a medium-sized ball that was very faint. Of course, at 70X, the magnification was too low to resolve much of the object.

The next opportunity was much better not only because of a higher altitude but because I was not just knocking off another NGC object. On June 8, 2013, I observed it from the top of Lee Canyon at the ski resort at 8,665 feet. It was clear, calm and warmer than I expected. In the afternoon, clouds formed over the mountains but they dissipated, at least visibly as dusk approached. However, the sky never really gave up the junk and seeing and transparency were never great the whole night. Everything blurred in and out of focus over and over again, both planetary and stars. Saw down to mag. 15.8 one time but couldn't find a mag. 12 galaxy another time, though the sky seemed quite dark and clear. The problem became quite evident the next morning when high thin clouds moved in from the west. We must've been getting the leading edge and just couldn't see it in the dark. Still a good night, and it wasn't very cold despite the altitude.

Using my commercial 16-inch f/4.5 Dobsonian, it was a nice but faint globular, especially at 102X. Didn't resolve very many stars, though I caught some comparatively bright

ones at the periphery. Was very grainy though, like something was there, just not quite resolvable. When I cranked it up to 229X, the cluster came alive with stars and had a more distinct and grainier core which I resolved. Still kind of dim which I attributed to the poor sky conditions.

Note that my drawing says 102X but the magnification and field of view should be 229X. I did such a great job on the drawing, I didn't want to try and redo it just to fix the magnification once I noticed the mistake after scanning it and plugging it into the page!

