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& Record Review

140 pages

# MAKING WAVES

Mola-Mola amplifiers – powered by innovation!



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# Mola-Mola Makua/Kaluga

Named after the wonderfully weird Ocean Sunfish, there's nothing prehistoric about the design of this pre/power combo with its bespoke phono, DAC and Class D tech  
 Review: **Paul Miller & David Price** Lab: **Paul Miller**

**A**s a mass production proposition, solid-state has been the only way to do amplification since the 1960s. Not only that, but traditional hot/warm-running Class A or A/B designs have held sway for almost as long, while super efficient, cool-running Class D designs have been trying to make headway in the notoriously conservative hi-fi world for at least the last decade. Crucially, high power Class D amps typically need little in the way of cooling, and can be used in small spaces. That's why so many consumer audio products now work this way.

## A GAME CHANGER

The trouble is that many folk don't like the sound of 'archetypal Class D'. Some early designs were particularly poor, presenting as detached and sterile, with little in the way of emotion. However, the innovative – and not a little eclectic – Mola-Mola brand aims to change all this with the £7499 Makua preamp and £4999 Kaluga monoblock amplifier combination here.

In a nutshell, Class D sees the audio signal represented as a series of analogue pulses, switched at high speed by specialised output transistors, the width of the pulses representing the amplitude of the (music) signal. The music, I might add, is only recovered after this high frequency PWM (Pulse Width Modulated) signal wends its way through a low-pass filter. In Class D circles, it's the design and implementation of this filter that so often separates the mediocre from the 'audiophile' amplifier.

While, over time, the breed has improved, an early Group Test [*HFN* Apr '08] showed that not all such amplifiers are created equal. One landmark advance was the arrival of the Hypex power module, utilising the UcD (Universal Class D) technology developed by Bruno Putzeys while working at Philips some 15 years ago.

**RIGHT:** The PSU [right] is screened inside the Makua preamp. The PWM DAC board [centre] features no fewer than three SHARC processors while the phono module [left] adapts to multiple equalisation profiles via the app controller [p37]

The Hypex solution has featured in many amplifiers tested in *HFN*, all benefiting from the module's consistent frequency response and distortion behaviour irrespective of the attached speaker's load impedance. It is little surprise that amplifiers based on these Hypex modules regularly outperform rivals, in sound terms.

Of course, a key benefit of Class D operation is that it offers dramatically lower power consumption than Class AB – >90% efficiency versus 50-60% – which makes it far more viable as a long-term technology going forward. But its audiophile credentials have risen too, particularly with the advent of the Hypex Ncore module [see PM's *Class D Done Right* boxout, facing page].

We're now watching it work its way into high-end amplifiers, starting with the NAD Masters M22 [*HFN* Apr '15] right up

to today's Marantz's PM-10 [p46] and this Mola-Mola Kaluga monoblock.

## EXCEPTIONAL VERSATILITY

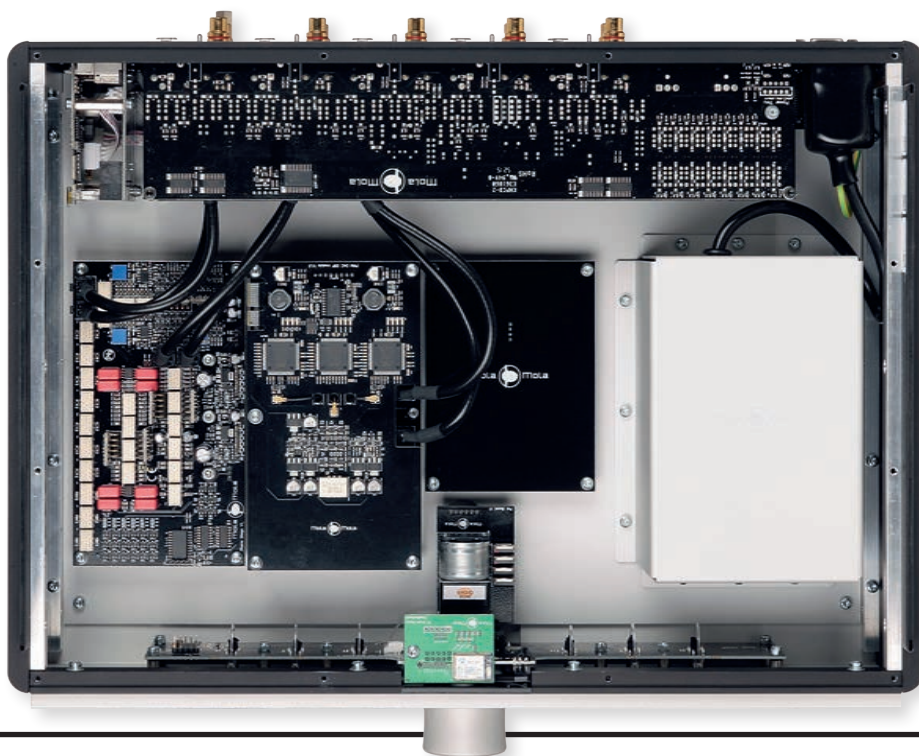
The latter has one key advantage, as it's also the brainchild of the man who created the Ncore module itself, the aforementioned Bruno Putzeys. It's an understatement to call him one of the

leading experts in his field, as I've said, playing the key role in the development of the Hypex Class D module, and then Ncore. The NC1200 modules inside the Mola-Mola power amp are capable of

producing significant amounts of power – the claimed 400W [see PM's Lab Report, p41] enough to drive practically any loudspeaker without the 'wobbly response' that afflicts conventional Class D designs.

More than just a biscuit tin with a volume pot, the Makua preamplifier

*'It's the brainchild of the man who created the Ncore module itself'*



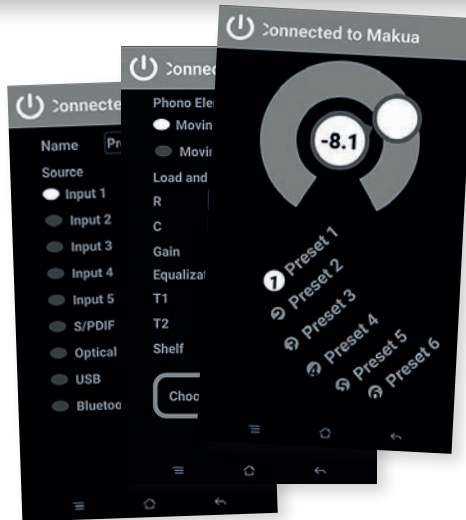




incorporates its own clever technology and is a statement product in its own right. Putzeys has gone to exhaustive lengths to create an exceptionally versatile control amp. Alongside five line inputs (either unbalanced on RCAs or balanced on XLRs, switchable at the back), it offers the options of both a custom PWM DAC (an extra £4299) and a highly configurable MM/MC phono stage (£1699). All stages use what is described as 'discrete amplifier modules working in single-ended driven differential mode', while the sophisticated relay-based volume control directly governs the gain of the preamplifier output.

The Makua offers two parallel outputs to facilitate bi-amping, both with phase invert and mono modes, plus balance and input gain offset controls. This is all done under full software control, and unusually uses Bluetooth to communicate with its custom app, rather than via a home network, to allow users to configure everything to their exact needs – so all you need is a smartphone or tablet.

The six small buttons on its fascia are programmable for any combination of channel, processing and routing – all via the app. You can even configure several inputs for different phono eq presets, of



**ABOVE:** Inputs are selected via six buttons and the exquisitely fine stepwise volume via a rotary but the Makua can only be fully accessed via its Bluetooth app [screenshots shown right]. Our sample had DAC and phono modules installed

class. However, while the swoopy, wave-like top of the casework chimes with its nautical name, it does impose restrictions on what you place atop. A matching handheld remote, crafted into a similarly curvy block of alloy, is available for £599.

### **🎵 SUPERBLY ABLE**

Class D's detractors argue that it's impossible to make the breed sound good, claiming it to be inherently 'unmusical'. Yet within seconds of setting ears on the Makua/Kaluga, it's obvious that this view is just plain wrong. There is no obvious downside here. True, it's not quite as open and translucent as the finest Class A amplifiers which I've heard – yet they represent a far more expensive proposition. Nor does it have the supernatural rhythmic ability of the best parallel, single-ended tube designs. But it's a way more practical purchase. It's immediately apparent that this is a superb sounding amplifier with a broad spectrum of abilities – getting on with the job of delivering vast swathes

of clean power into whichever loudspeaker you choose.

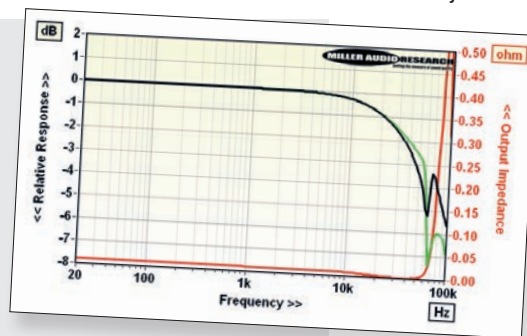
Tonally smooth and seamless, dynamically and rhythmically expressive, broad and deep in its soundstaging, powerful in its bass, open in the midband and sweet in the treble – it simply sounds right, and from

multiple vintages, alongside gain setting in 5dB steps and cartridge loading for all MM and MC types. The app even grapples with the volume control, though the chattering of the relays is a little unusual. Moreover, the preamp 'talks back' to the app, so the latter knows if you are making manual changes to volume or input.

The superlative matt aluminium finish of both pre and power confers a sense of pure esoterica, eschewing American or Japanese aesthetic conventions yet still exuding

### **CLASS D, DONE RIGHT**

Coincidentally this is not the only Ncore-powered amplifier in this issue of *HFN* – the Marantz PM-10 [p46] features bridged NC500 modules for a heady 600W output. The Kaluga monoblocks, however, are the first amplifiers we've seen where Ncore Class D modules – the NC1200 in this instance – have been implemented by the man who designed the technology in the first place. And, as you might expect, they represent the most elegant and technically proficient example of analogue Class D we've tested. Many Class D amps still use a bridged (H-network) architecture where the amp/speaker frequency response is hugely influenced by undulations in the speaker's load impedance. Reviews of these products are typically reviews of the specific amp/speaker combination. But not here... Ncore's novel compensation offers a vanishingly low (5-9mohm) output impedance [red trace, inset Graph], only rising steeply above an ultrasonic 60kHz. So, while the Kaluga has a very subtle treble roll-off, its response varies by less than  $\pm 0.1\text{dB}$  from 8ohm down to 1ohm loads [black and green traces]. Very few amplifiers, Class D or otherwise, are so immune to speaker loading. **PM**



this all else follows.

Steve Hackett's 'Narnia' from *Please Don't Touch!* [Charisma VJD-28208] shows it to have an evenness of tone that few conventional designs have: there's none of the 'chrome plated' upper midband you get from some, or the mush or grain you hear from others. Instead, the Makua/Kaluga is super-clean. ➔



## BRUNO PUTZEYS

'Most Class D designs are industrialised well before every last stone is turned and so innovation stops,' suggests Mola-Mola's Bruno Putzeys. 'Until they see a competitor screeching past who, in turn, goes to sit on their laurels. That'll never work – if you want to have some hand in your own destiny you have to race yourself, not someone else.'

Belgian-born Bruno worked at Philips for ten years, 'and that gave me the opportunity to try out every crazy Class D idea I wanted to... I then moved to Hypex to commercialise UcD and invent the follow-up, Ncore. I quit both in 2015 to co-found Kii Audio in Holland to work on active speakers. In parallel I started research company Purifi with Lars Risbo [of TacT Millennium fame] where we threw ourselves at loudspeaker drivers.'

He points out that, 'Class D is the obvious choice for all the right environmental and practical reasons but it's a fantastic challenge to get good audio performance. This makes learning how to design audiophile Class D amplifiers a worthwhile investment.' As for the idiosyncratic moniker, Bruno says that, 'an agency came up with the Mola-Mola name and logo. We loved it immediately on the grounds that it is stylish, wacky and impossible to forget.'

Bruno is now working on a standalone version of the Makua DAC module called the Tambaqui. 'It'll do to other DACs what the Kalugas do to other Class D power amplifiers...' he promises, 'after that you can expect a very special integrated.'



Via the balanced line inputs, there is no particular part of the spectrum where it shines its light brightest. Not even Supertramp's 'Take The Long Way Home' from *Breakfast In America* [A&M Records 393 708-2] could push it into shrillness. This album was mixed for dull American FM radios of the late-1970s, and Roger Hodgson's reedy voice can grate – yet the Makua/Kaluga remained beautifully balanced.

Indeed, as you twist the volume control clockwise, things stay consistent, with no sense of bass suddenly falling away, or treble running into trouble, even at very high levels. This is another instantly likeable trait – things remain all-of-a-piece and in control, whatever demands are made on the amplifier. A key facet of this is its bass performance, for regardless of the different loudspeakers I asked it to drive there was always a wonderful assuredness.

It isn't quite as rich and sumptuous as some high-end amplifiers, yet it has

**BELOW:** Bruno's NC1200 Class D Ncore amp module sits adjacent to the 4mm speaker terminals, powered by a SMPS1200 PSU [right]

**ABOVE:** Each Kaluga monoblock is roughly half the width of the Makua preamp, sharing the same 'wave' case design with sled-like feet

seemingly endless reserves and remains accurate and tuneful at all times. Those who want a fat bass should look elsewhere, as instead the Mola-Mola Makua/Kaluga

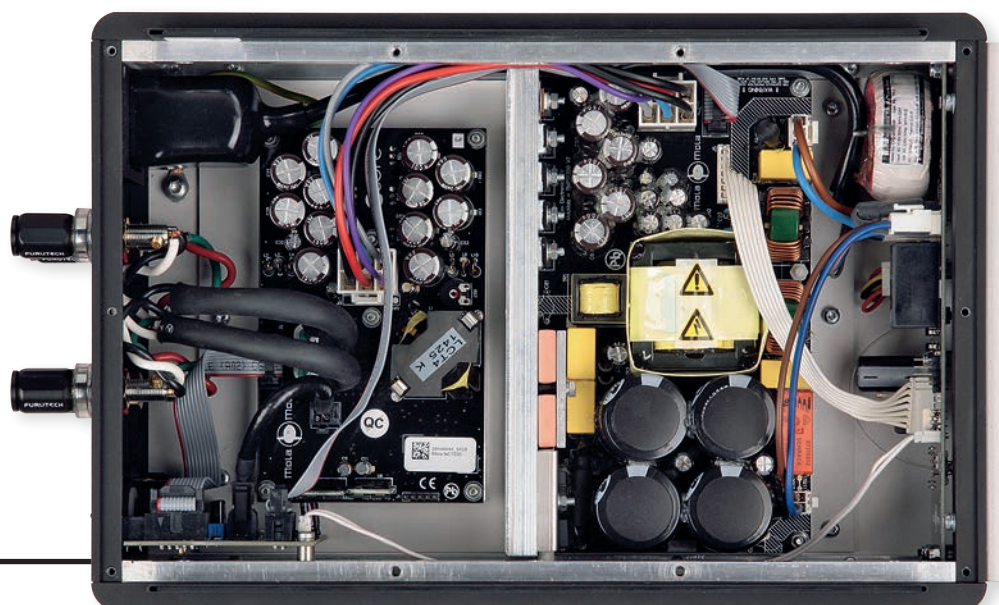
'They simply sound right, and from this all else follows'

goes for *accuracy*. It can deliver vast tracts of LF into your loudspeakers should the need arise. 4hero's 'Cosmic Tree' from *Two Pages* [Talkin' Loud 558 462-2] illustrates the point, thanks to the gutsy Moog-

generated sub-bass running throughout the song, which becomes highly animated at several points. The Makua/Kaluga served up all it without a single hair out of place, so to speak. Effortless even at high levels, it seems to look at domestic hi-fi loudspeakers – and the demands they place upon it – with complete indifference.

### NOTHING FORCED

Few Class D amplifiers I have heard really let you 'zero in' on individual instruments in the mix and follow them right through the song. Yet present the Makua/Kaluga with

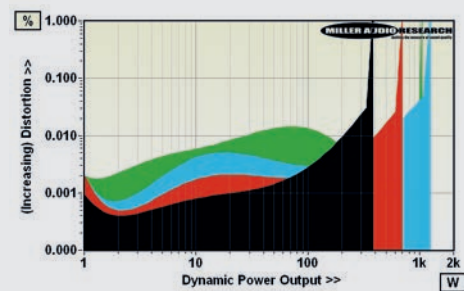




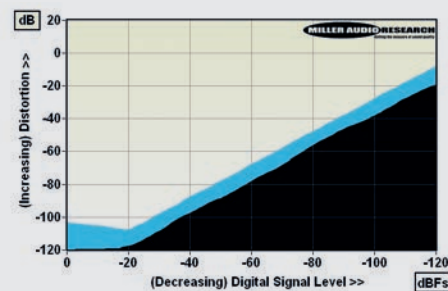
## MOLA-MOLA MAKUA/KALUGA

Tested via its DAC option, the Makua preamp's maximum safe volume is '4.0' (or 9.75V out) where distortion is extremely low at 0.00004-0.00045% over the top 30dB of its dynamic range (20Hz-20kHz, all sample rates) and the A-wtd S/N a very considerable 121dB [see Graph 2]. One digital filter option was enabled on our sample – a linear phase type with equal pre/post ringing traded against a 79dB stopband rejection. The response(s) are tailored with sample rate, being ruler flat to within  $\pm 0.03$ dB up to 20kHz with 44.1/48kHz media but rolling off slightly earlier at -3dB/36kHz and -3dB/59kHz with 96kHz and 192kHz files, respectively. Low-level linearity is true to within  $\pm 0.1$ dB over a 100dB range ( $\pm 0.5$ dB over 120dB) while jitter is incredibly low: less than 8psec at all sample rates!

The analogue preamp stage necessarily offers the same low distortion and wide S/N but with a response that's flat to within  $-0.01/+0.04$ dB from 1Hz-100kHz through a (balanced) output impedance of 22ohm. The partnering Kaluga power amp did meet its 400W/700W 8/4ohm power specification at 1.5% THD but was closer to 370W/8ohm and 675W/4ohm at 1% THD with 382W, 705W, 1255W and 1025W achievable into 8, 4, 2 and 1ohm loads under dynamic conditions [see Graph 1]. Gain is fine at +27.7dB and although the 81dB S/N (re. 0dBW) is a little below average (albeit purely white noise) distortion remains low at 0.0002% up to 10W, increasing to 0.002% at 100W and 0.03% at 300W (all 1kHz). Distortion increases rapidly above 10kHz, however, to 0.05%/20kHz/10W (0.7% at 40kHz) in line with the tailored response of -0.9dB/20kHz to -5dB/60kHz. Remarkably, the output impedance remains  $< 0.009$ ohm from 20Hz-20kHz [see boxout, p37]. PM



ABOVE: Dynamic power output versus distortion into 8ohm (black trace), 4ohm (red), 2ohm (blue) and 1ohm (green). Maximum current is 32A for 10msec



ABOVE: THD vs. 24-bit/48kHz digital signal via S/PDIF and USB over 120dB range (1kHz, black; 20kHz, blue)

## HI-FI NEWS SPECIFICATIONS

Power output (<1% THD, 8/4ohm)	370W / 675W
Dynamic power (<1% THD, 8/4/2/1ohm)	382W / 705W / 1255W / 1025W
Output imp. (20Hz-20kHz, pre/power)	22ohm / 0.005-0.009ohm
Freq. resp. (20Hz-100kHz, pre/power)	+0.01 to -0.04dB / +0.0 to -4.7dB
Input sensitivity (for 0dBV/0dBW)	161mV (pre) / 118mV (power)
A-wtd S/N ratio (re. 0dBV/0dBW)	102.2dB (pre) / 80.7dB (power)
Distortion (20Hz-20kHz, 1V/10W)	0.00014-0.0033%/0.0003-0.03%
Power consump. (pre/idle/rated o/p)	43W / 24W/405W
Dimensions (WHD in cm) / Weight	42x11x35/20x11x34cm / 11/7kg



ABOVE: Preamp (top) offers five ins, on RCA or XLRs, routed via (optional) phono or line stages. Note digital module [far left]. Balanced (XLR) and single-ended (RCA) outs connect to XLR/RCA ins on the Kaluga mono amp [below]. Each has pairs of 4mm outs

a densely mixed and compressed classic pop recording such as Elvis Costello's 'Oliver's Army' from *Armed Forces* [Imp Records IMP FIEND CD 21] and it delivers an unerringly stable, almost 'architectural' sound.

The listener is allowed to absorb the mix in all its complexity, with each different instrument playing alongside one another. So many amplifiers can turn this song into a generic mush, yet this combo let you hear each musical strand do its own thing. There's no price exacted for such transparency, however. The Makua/Kaluga pairing doesn't sound as bright or as analytical as other apparently 'forensically detailed' amplifiers. Everything is there to be heard, yet it is never forced on you.

### LITHE AND TUNEFUL

This combo has real strength-in-depth, with no nasty surprises as you switch between inputs. The digital in – both via S/PDIF and USB – largely proved to offer more of the same, with a slight firming-up of images to add to its already superb stereo soundstaging. The Makua/Kaluga indeed has a spacious feel to it, able to present a vast recorded acoustic where everything is locked in place with nothing lost in the ambience.

This ties in with its aforementioned unflappability at high volumes and smoothness from bottom to top – it's another facet that's part of its big, confident yet calm character.

Grant Green's 'No 1 Green Street' from *Green Street* [Blue Note 7243 5 40032 2 6] had immense scale and clarity, with instruments as if

bolted to the back wall. At the same time, the Makua/Kaluga created a satisfying soundstage where you could practically tell the distance between the four walls of the recording venue.

The phono stage was excellent too. It proved exceptionally quiet and well up to the standards you'd expect from an audiophile preamplifier. My vintage pressing of Beethoven's 'Pastoral' Symphony with Karajan and the Berlin Philharmonic [DG SLPM 138 805] sounding particularly broody and atmospheric. Bass was lithe and tuneful, the midband delicate and satisfyingly three-dimensional, while the treble had a wonderful satiny texture to it.

To sum up, the Makua preamp/Kaluga amplifier is a brilliant 'do-it-all' high-end design, highly capable across a broad range of fields, from its ability to track the smallest to widest dynamics, to its prowess at unpacking the densest of recorded mixes so that you can see – hear – right into the musical picture. ⚡

## HI-FI NEWS VERDICT

What's not to like about an immaculately presented, ultra versatile pre/power amplifier that drives even the toughest speaker loads imperiously, and has vast reserves of power? Not only that, but the Mola-Mola Makua/Kaluga does this with great decorum and finesse, and no small measure of style too. Indeed it's all such fun that naysayers would never think it a Class D design – proof positive surely that it has come of age.

Sound Quality: 89%

