HIGHER PERFORMANCE SAILING

Faster Handling Techniques

Frank Bethwaite

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2006 World 29er Champions Silja Lehtinen and Scott Babbage sailing a 29erXX in a fresh breeze.

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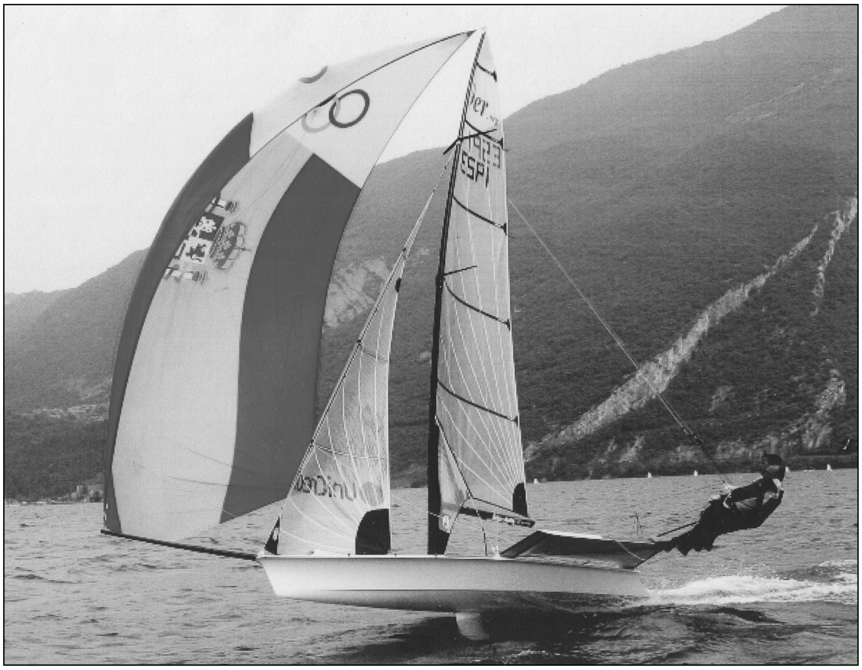

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TITLE PAGE Iker Martinez du Lizarduy and Xabier Fernandez Gaztanaga from Spain, Gold Medal winners at the Athens Olympics.

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Introduction

High Performance Sailing, published in 1992, describes how the wind works, how the waves work, how the conventional boat works, and how to shape and trim sail for best VMG (velocity made good) in different winds and waves.

Higher Performance Sailing, published in 2008, introduces the apparent wind sailboat and describes how its more complex dynamics meshes with new discoveries about the wind to tack downwind at three times the boat speed of its predecessors.

Apparent wind sailing

Ice yachts have been able to tack downwind at four or five times wind speed for 100 years, but there are so few of them, and so little about them appears in the media, that to the world's wet-water sailors they have always been mystery boats. How to sail them has been regarded as an irrelevant black art that was just that – a skill not relevant to 'real' sailors.

In the decades from 1970 to 1990, the Eighteen footer skiffs of Sydney adapted iceboat technology to wet-water sailing and tripled their downwind speeds. The new spectacle of these skiffs flying down the harbour at unprecedented speed attracted big harbourside and ferry spectator crowds, and within a few years this exciting new style had expanded into a sports television programme which achieved top prime-time ratings.

The phrase 'apparent wind sailing' was coined, and apparent wind sailing technique was promoted from 'irrelevant black art' to 'legitimate curiosity'.

In 1996 the unthinkable happened – the skiff-derived 49er was selected as the Olympic pinnacle class to bring spectacle to Olympic sailing, and in 1998 the 49er was followed by the 29er, a youth trainer that 'sails like a skiff to train for a skiff'. Within a year, the 29er was being built in six countries worldwide, and quickly became one of the two world youth trainers.

The designers of bigger boats are now adopting the technology developed by the skiffs to the point where a new genre of big swing keel apparent wind monohulls of America's Cup and Volvo size, and big multihulls, can also fly downwind at unprecedented speeds.

Quite suddenly, the apparent wind revolution has become global, and apparent wind sailing and handling technique has become very relevant indeed.

Higher Performance Sailing

In 1998, at the time of the second (of five to date) reprints of *High Performance Sailing* (*HPS-1*), I was requested by the publishers to revise it 'to cover the new science and technique of apparent wind sailing'.

As the work began to take shape, it became evident that the scope, extent and difference of the new material was more than could properly be accommodated within an internal revision. So what started as a revision has developed into this new work that extends and refers to, but does not repeat, *HPS-1*.

Higher Performance Sailing (*HPS-2*) introduces three new areas of sailing art to the sailor who wants to excel, and who wants to know what he would be letting himself in for if he made the change from blow-downwind to tack-downwind sailing.

Technology

The first part of this book introduces the apparent wind sailboat.

Chapters 1 to 22 explain the history and the evolution of high performance conventional sailing, and then of apparent wind sailing, to the sailor who wants to understand the technical background of this new way of sailing faster. It explains:

- How the wind works at three levels of its spectrum which have previously been little studied or discussed.
- How apparent wind boats work – the light strong materials from which they are made, the construction methods used, and the new dynamic principles involved in their design, rigging and handling; all of which work together to make the new performance levels possible.

Handling

The second part of *HPS-2* introduces the discovery that, at the subconscious level, two parallel handling techniques have coexisted for many decades. *Natural handling technique* is used, completely unconsciously, by the great majority of sailors. These are the sailors who always follow and never win. *Fast handling technique* is used, equally unconsciously, by the few champion sailors who always lead and share all the wins.

Consciousness of the importance of this as a separate subject area arose as a direct consequence of the much higher speeds at which the new boats sail.

The smaller apparent wind sailboats – the B-14, 29er and 59er (and no doubt others that I do not know) – are truly delightful, fast and exciting boats to sail, and are simple to handle in the same sense that it is simple to ride a bicycle or use a pair of skis once you have learned how to do it.

I have introduced large numbers of mature sailors who are still young at heart to these faster sailboats. The high point is to hoist the spinnaker and feel the boat accelerate and settle into its 'faster than the wind' tack-downwind mode of sailing. But both the sailors and I have been surprised to find that most of them experienced a totally unexpected difficulty. What was happening was that they had never previously handled any boat that could sail at sustained, really high speed, so had never learned either the balance techniques necessary to handle all fast sailboats, or the co-ordination necessary to handle *any* sailboat at real speed.

A few years later, much the same phenomenon arose with motivated sailors of conventional boats who improved their handling skills on the sailing simulator, but also experienced unexpected difficulty when they returned to the water with a new capability to sail at speed.

Access to the sailing simulator has been like having access to a microscope where previously the view has been through frosted glass. This has enabled me to look more closely at the handling component of sail training, and from there to look at the whole of 'sailing' itself. This has led to the seminal identification of the slower *natural* and the faster *fast* handling techniques, both of which coexist at the subconscious level and that we can now see have been responsible for so much woe in past years.

At root, natural handling technique is quick and easy to learn because no co-ordination is called for and its 'luff for everything' control of roll is consistent; this is why the great majority of sailors have learned natural handling and sail this way. But this simplicity comes at a cost:

- Because natural handling is intrinsically slower than fast handling, 'natural' sailors follow for all of their lives and never lead in, nor win, important races.
- Because fast handling technique as applied to both conventional and apparent wind sailboats necessarily involves the balance of the cyclist, the skater or the skier, and because the natural sailor has never learned this skill, this is why he or she characteristically has difficulty in controlling any boat either in strong winds or at real speed. This also explains the unexpected initial difficulties of motivated sailors in controlling the smaller, but still very fast, apparent wind sailboats.

Chapters 23 and 24 discuss this new way of thinking, and Chapters 25, 26 and 27 describe exactly what fast handling technique is and how to learn it – also, how and where it differs from natural handling technique, and why it is intrinsically faster. Access to the sailing simulator has enabled the way in which champion sailors handle their boats to be observed and described in more exact detail than has ever previously been possible. The material in these chapters has been developed over several years, and has reached the point where motivated 'natural' sailors, who want to excel, are now using it to learn the fast handling techniques used by the champion and in this way they are at last lifting their game, sailing at lead-group speed, and beginning to enjoy the occasional win.

Putting it together

Chapters 27, 28 and 29 describe in exact detail how today's champion sailors handle their blow-downwind and tack-downwind sailing, and fly both upwind and downwind to win world championships and Olympic medals.

As of 2008, Chapter 28 is unique. The technology of foil-borne sailboats has been a fringe activity for decades, but as *HPS-2* goes to press, it has recently and suddenly become practical. Moths equipped with foils are now consistently dominating their World Championships, and already on occasion are sailing faster than any other sailboats in the same winds. The potential is huge.

In Chapter 28, Rohan Veal, the helmsman primarily responsible for this revolution, describes how to sail these new craft.

Overview

In this book I record the history of the apparent wind revolution. It has been my good fortune over four decades to observe this whole process from within. Deep involvement with its developing technology, discovery and analysis of the new principles that have emerged, and association with the many gifted designers and sailors who have made it all possible, have been a year-by-year source of pleasure, excitement and deep satisfaction.

This book is dedicated to:

- Every young sailor who dreams of flying down the harbour twice as fast as his parents believed possible.
- Every mature sailor still young enough at heart to share the same dream.
- Every present follower who dreams of the fun and pleasure of sailing in the lead group, the deep satisfaction of the occasional win, and the enhanced self-esteem that will come from walking tall in his or her chosen recreation.
- Every reader who, for whatever reason, is not close enough to the water just now, but who dreams of taking the mainsheet and tiller and joining in the fun of this new way of sailing.

It is my privilege, and that of my many contributors, to share this new fun and pleasure with the reader.

Acknowledgments and thanks

While writing this book I invited a number of brilliant sailors to share their knowledge. They responded magnificently, and *HPS-2* has become a more useful, more authoritative and richer book as a result of their contributions:

Robin Elliott, of Auckland, New Zealand, a sailing historian, who has provided much of the early historical material and pictures in Chapter 1.
Ian Bruce, Montreal, of Laser fame, has provided the material and photos of the seminal Herrick Duggan years.
Harry C (Buddy) Melges has spent a lifetime among iceboats and lake scows. He is probably the fastest sailor in the world – on ice.
Lindsay Cunningham held the Little America's Cup for decades. He has held the open speed record for sailboats twice, and the speeds of his triscaphes are very close to those of the sailboards of Finian Maynard.
Finian Maynard was the world's fastest wet-water sailor, on sailboard at the time of writing.
George Chapman, assisted by his son Joddy, was for decades the voice of the aspiring foil sailor.
Ian Ward took the leap to sail his foil Moth, rather than just sit in it.
Rohan Veal has, by vastly refining and perfecting the new four-mode handling art, propelled the foil Moth from obscurity to centre stage.
Paul Cayard with his 'nature never reveals everything, and no sailor ever sees everything that nature reveals' states the essentials about scanning and planning.
Mark Bethwaite describes how a disciplined approach to scanning and planning, plus acute observation, can lead to eight World Championships.

Rob Douglass describes how calculated risk assessment and management can lead to a world championship by avoiding foreseeable disaster.
Scott Babbage describes how enlightened thinking about handling and performance detail, and focused practice to achieve flawless crew co-ordination to achieve full potential performance, is another way to a world championship.
Emmett Lazich describes how focused attention on crew co-ordination, with separation of strategy from handling, is yet another route to a Gold Medal.
Julian Bethwaite has originated far more than his share of the 'cut and try' developments – his three two-hander Eighteens, the asymmetric spinnaker, the flexible 'fibreglass' topmast, *Looney Tunes*' wishbone rig, the flat 'run-across' deck arrangement, the low-drag solid wings, the mainsail cuff to the deck – the list goes on.

As I have aged, my role has become to observe and measure, then later to analyse why some of the 'cut and try' changes work better than expected (for example, the cuff on the mainsail increases boat speed by enhancing the turbine blade effect over the lower jib). This follow-up analysis has often paved the way for the next intuitive try.

Between the author's often uneven draft 'proof-read' copy and the more polished, consistent, easier to read and well-reviewed copy supplied to the publishers lie the reviewers and proof-readers. I thank:

Professor Richard Spencer, University of British Columbia, Vancouver. Richard has assisted greatly with better and more accurate explanations of concepts, and particularly with replacement of words that carry a different meaning in North America from Australia.
Ted Hamilton is the most technically aware man that I know, and is ruthless with error, no matter how small.
Mark Bethwaite brings the champion sailor's 'no nonsense' overview to the task, and his comments have resulted in much re-writing to achieve clearer expression.
Nicola Bethwaite (Beijing would have been her fourth Olympics but shortly prior to the regatta she broke both arms in a mountain bike accident and could not compete) similarly brings the champion sailor's wider overview, but her corrections express it in finer detail.
Nel Bethwaite, my wife, deserves my particular thanks. For years she has put up with a husband who is so often 'somewhere else' as he searches for the better approach or word or phrase. Without her unfailing support there would be no book. She has provided the environment that has made it all possible.

Measurement systems

The world has not as yet agreed a uniform system of units. My professional background is aviation, associated with science and meteorology. The ICAO units used internationally by the aviation industry when I was flying were:

Distance: nautical miles, tenths and feet.
Speed: knots (nautical miles per hour).
Weight: pounds.

These are the units I am accustomed to, and used in *HPS-1*, and will continue to use in general in this book. American readers will be comfortable with these Imperial units. But there is a steady global shift towards the metric system that affects all of us, and where use of the decimal system makes for simpler explanation, I now find myself using it naturally.

On balance, I believe that if I were to standardise on either all Imperial units, or all metric, the result would now appear to be forced. So *HPS-2* will be a creature of its time, and use whichever system best serves the subject under discussion.

Author's note

When notes in this format appear within the text, it is my note – not that of the contributor of the section concerned.

Frank Bethwaite

LIST OF ILLUSTRATIONS

PART ONE

Perspective

Chapter 1 • The Origins of High Performance

1.1 ■ Summary

Sailboat performance remained unchanged from its beginnings 4000 years ago until about 1800, and exceptions such as the Polynesian proas were rare.

The first speed increase, from 1800 to 1900, was to set bigger sails and use movable ballast to keep the boat upright.

The second speed increase, from 1895 until 1905 with a trickle-through effect until 1950, was to use lighter, flatter hulls to plane over the water faster than heavier, rounder boats could move through it.

The third change, from 1980 and continuing, is the apparent wind revolution in which downwind speeds faster than the wind have become routine.

A fourth change, in which foils lift the hull clear above the water, is just becoming practical (2007) in that Moth class dinghies now win regattas in all wind and sea-state conditions by using apparent wind technology on a foil rather than a displacement or planing support platform.

In a book about 'high performance', it is necessary to define what constitutes 'high performance' as opposed to 'everyday performance'. In recent years, accurate comparative measurements of speed by GPS (global positioning system) have become routine. In the years prior to accurate measurement, I have taken as my yardstick the behaviour of the interested onlooker – meaning that where people have reacted strongly with an 'If you can't beat them, ban them' response to a new performance level, we can be certain that the performance difference was real.

1.2 ■ The first 4000 years

Man has used small flotation – logs, coracles, dugout canoes – for tens of thousands of years. Use of substantial ships can be traced back to Crete at least 6000 years ago. The Phoenician traders of about 4000 years ago are reputed to have been the first to have used sails. From those beginnings, the craft of shipbuilding and the art of sailing and navigation spread worldwide.

All sailing vessels, wherever built, had two characteristics in common. They were heavily and strongly built for a long life in a severe mechanical and chemical environment. Their sail areas were modest so that they could survive the periodic unexpected sudden strong gust.

Because all sailboats were heavy and had modest sails, all boats of the same size would have sailed at about the same speed regardless of where or when they were built (see Fig 10.3). For this reason, until relatively recently, sailboat performance has remained almost unchanged since the development of the first sailboats.

1.3 ■ The century of bigger sails – 1800 to 1900

The first step towards higher performance in sailboats was taken almost simultaneously, 200 years ago, by two groups of boats on opposite sides of the world. Both the sandbaggers of New York and the skiffs of Sydney began to shift ballast to enable them to carry bigger sails.

1.4 ■ The sandbaggers of New York

The history of the sandbaggers goes back to the early 1800s. They were the fishing boats that serviced the fish markets of the growing city of New York. Oysters were a main food staple and were harvested in the Hudson river estuary by wide flat-bottomed boats that could skim over the oyster flats even when carrying a heavy cargo. The smallest were the lightest and flattest. Bigger, deeper sandbaggers fished the more open waters.

The estuary of the Hudson river was a natural area for both sailing and spectating, being a big area of water deep enough for sailing and protected from the ocean swells by a narrow entrance. The estuary also enjoyed a mild climate and in summer there was often a steady sea breeze. Inevitably, at some point, crews started racing each other. Onlookers began to gather on the vantage points of the shoreline to enjoy the spectacle and soon they started to gamble on the results. This led to a situation where the weekday workboats were re-rigged with longer, lighter spars and bigger sails for racing each weekend, but they remained rigged with mainsail and jib only.

To keep them upright under the press of the bigger sails and no cargo, they carried ballast in the form of bags of sand or gravel of a weight convenient to heft onto the windward deck on each tack. The length of the hull was the only rule for each class. Spars and sails grew progressively until they were enormous, and the bags of ballast became heavier and the task of shifting the bags on each tack became more demanding.

Initially the races were intermittent, but by the 1840s a regular match racing programme was underway. In a city that understood ships and the sea, this racing attracted increasingly large audiences and the interest grew.

It is interesting to make a comparison of the overall approach to sailing faster between the sandbagger technology and the open skiffs of Sydney of the same era (see Section 1.6).

The sandbaggers dealt with lighter winds and stronger winds by changing weight. They always sailed with mainsail and headsail only, plus sometimes a gaff topsail, and they never set or dropped extra sails such as spinnakers during a race. This approach allowed them to sail with a minimum crew of skilled sailors – probably a helmsman, a mainsheet trimmer and a headsail trimmer.

On light-wind days they would have sailed 'light': the boat, three skilled sailors, plus minimum sandbags and the fewest number of hefters possible.

On strong-wind days they would have sailed 'heavy': the same three sailors would not have set the topsail, and might have reefed mainsail and headsail pre-start, and would have carried more sandbags and enough hefters to handle the extra sandbags to give maximum efficiency and speed in the wind expected during the race.

Fig 1.1[1] shows the lines of *Una*, a small sandbagger-type dinghy which was built in 1852 by Cap'n Bob Fish and exported to, of all places, Cowes in England. Somebody obviously had a sense of humour because Cowes was then the spiritual home of keelboat yachting worldwide. In the Cowes environment of the day, conservative design was applauded, size won the social Brownie points, and a tiny unconventional 'foreign' sailboat had to be at the very bottom of the heap. But the import left its mark. With a centreboard and small single mainsail, she represented the extreme of simplicity and manoeuvrability compared with the local craft of her size and larger. Her speed and handiness in smooth water and moderate breezes made her popular, and that style of rig became known as and is still referred to in the UK as, a 'Una' rig.

Fig 1.2 shows the lines and Fig 1.3 the appearance when racing of a 27ft sandbagger of 1869. Fig 1.4 (the Sheridan Prize) shows the general rigging arrangement on the model. By the 1880s sandbagger racing had grown to the point where up to 40 boats were taking part in weekend regattas.

Sandbaggers and skiffs were the first racing yachts to employ movable ballast. In any breeze they were fast and impressive to watch, but when pushed beyond their limits they could come to grief in spectacular

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[1] All of the original 'lines' drawings from which I have drawn Figs 1.1, 1.2, 1.9, 1.13, etc are in places faded or even obliterated by age or mildew to the point where I deemed them unsuitable for publication. In each case I have restored them by copying the original, 'whiting out' the blotches, copying the remainder very feint, and then hand-restoring the feint lines and gaps with the more even lines you see. The plan of *Mercia* (Fig 1.15) is the worst degraded, to the point where the area around the forward centrecase is uncertain. This and other small uncertain areas have been left blank in the restoration.

Similarly, the only pictures that now exist of breakthrough boats of a century ago are usually copier copies of faded newspaper or magazine pages. If the dots per inch are less than now deemed ideal, I take the view that this is a small price to pay. I thank Robin Elliott, Bruce Stannard and others for their welcome help in making these unique and invaluable pictures available.

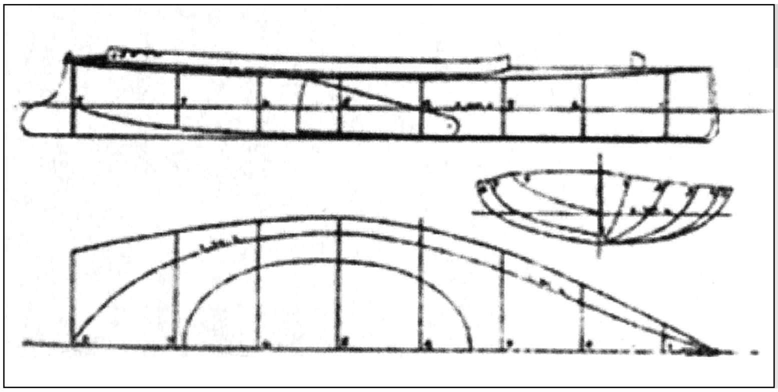


Fig 1.1 Lines of *Una*

A small sandbagger-type dinghy, built in 1952 by Cap'n Bob Fish, New York. Courtesy of Robin Elliott.

Fig 1.2 Lines of sandbagger *Bella* (faded lines restored)

LOA 27ft 3in, beam 11ft, draught 1ft 9in. Courtesy of Robin Elliott.

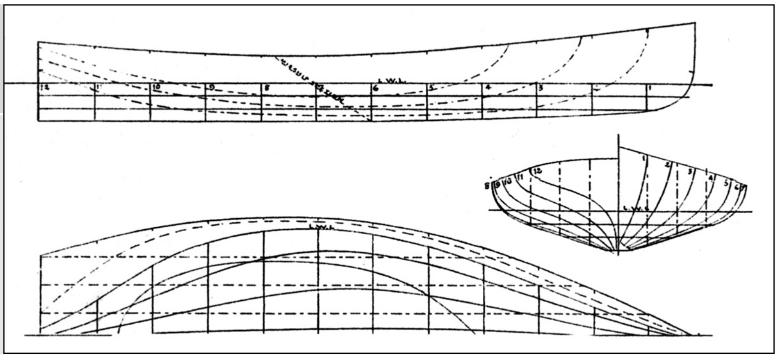
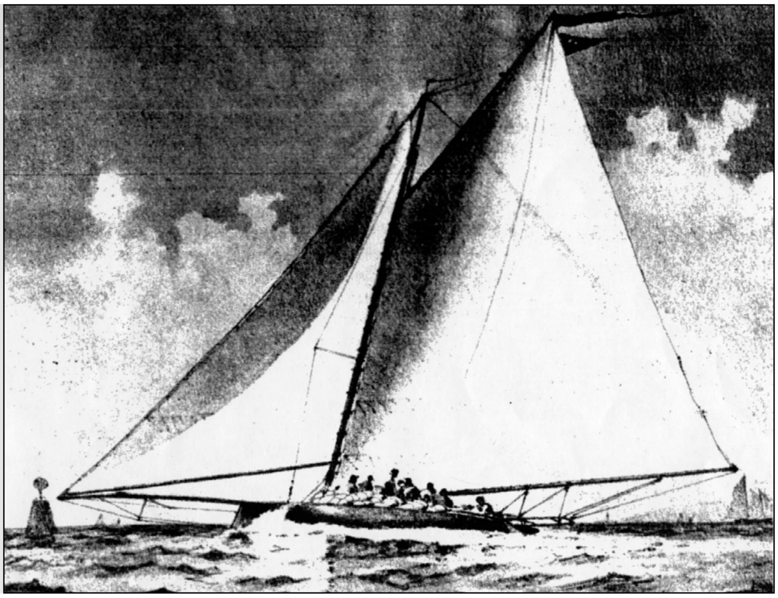


Fig 1.3 Sandbagger racing

Pluck and Luck LOA 23ft 7in, beam 10ft, draught 1ft 9in, built in 1875 by Jake Schmidt. Courtesy of Robin Elliott.



capsizes. These racing fleets attracted big audiences, and substantial gambling by both crews and spectators became a strong feature of the activity.

But success at this level begets envy, and the sandbaggers offended the 'establishment' sailors in three ways.

The New York establishment of the day followed English sailing culture, in which the ideal yacht was deemed to be a conservative craft as opposed to a dinghy-like craft with movable ballast. But these conservative craft simply could not match the speed of the wide, light, shallow 'skimming dish' sandbaggers that carried no fixed ballast, but in which strong hefters moved bags of sand or gravel onto the windward gunwale on each tack.

Their first sin was to sail so much faster than the 'gentlemen's' yachts. They did this because the 'power to weight' ratio of the best sandbaggers in racing trim (in this case the ratio of their sail-carrying power to their total weight) was much greater than that possible with a conventional design in which heavy ballast is carried either in the hull or fixed centrally on the keel.

The second sin, professionalism of the crew, was social. The sandbaggers were regarded as 'people's boats', often associated with, and usually crewed by, a team of longshoremen from a local waterfront bar. With prize money at stake, and the boat from the bar around the corner victorious last week, the strongest and best hefters of sandbags were paid to crew. In the eyes of amateur gentlemen sailors, this compounded the offence. Not only were the lighter, flatter 'skimming dish' sandbaggers much faster, length for length, than the amateur gentlemen's yachts, but the source of their speed was hard work performed by a paid crew.

The third sin, sponsorship of favoured boats, was the last straw. Wherever there are big gambling stakes, there has always been money available to help the favourites go a little faster, and sailboats are no exception. In the eyes of the amateur 'Corinthian' sailors, this combination of spectacular speed, based on the work of paid crews in sponsored boats, was unforgivable.

Nobody is suggesting that the two groups shared the same starting lines. The exclusive yacht clubs used high joining fees to exclude the sort of people who sailed sandbaggers, but there was no avoiding the fact that the slower yachts were publicly ignored, while the speed and spectacle of the racing sandbaggers commanded big public audiences. Magazines such as *Harpers Bazaar* featured sandbaggers racing on their covers. After a while, being ignored became too much to tolerate.

The reaction was double-edged. First, the sandbaggers were dubbed 'extreme and dangerous', and this accusation was pushed hard enough in the media to generate some public support against them. Second, around 1882 the Seawanhaka Yacht Club drew up its Seawanhaka Corinthian Racing Rules.

These rules banned entry from any yachts that shifted ballast, or were in any way crewed by professionals. This got rid of all three irritants: the boats that were fast because they moved ballast, the strong hefters who were paid to move the ballast, and the very skilled fishermen who sailed these extreme boats so well. As more and more clubs adopted this Corinthian philosophy, a divide – driven not by one but by *two* differences of approach – was created between this growing group of similarly minded clubs and the working-class sandbaggers. One difference was the Corinthian philosophy. The second, at root, was the 'respect for the rules' vs the 'respect for performance' conflict. The clubs introduced growing regulation – the requirement to furnish hull lines and rig plans, crew lists, and crew occupations – to enforce both their attitudes and stability. The sandbaggers had traditionally observed no rule other than the length of the boat and, when pushed, had simply set more sail or carried more ballast. Another factor was the encroachment of new piers which progressively deprived the viewing public of the close-up view of the spectacular sailing. As the years went by, the pressure on the sandbaggers increased, and political clout of the establishment sailors was sufficient to make the Corinthian rules prevail in the waters of New York. The sandbaggers were made unwelcome, and for this and other reasons organised sandbagger racing declined and vanished from the Hudson river estuary – for a while.

But they survived, and their first tactic was to roll with the punch and relocate further south. Some sandbaggers began to sail in and around Delaware Bay, where a few sail as 'vintage boats' to this day. Their numbers were small, their social impact was negligible, and they trod on nobody's toes, so they were left to sail in peace.

Their second survival ploy was to move west. They were purchased by mid-west sailors because they were the fastest boats of their time. We will look at the Inland Lake Yachting Association and their lake scows in more detail later, but the broad picture from the Inland Lakes Yachting Association's history is that recreational racing on the inland lakes near Chicago started in earnest in the late 1850s, and that many of the racing yachts from inception, until true scows were born about 1900, were the 'gravel wagons' imported from the east (see page 11).

The sandbaggers' third survival mechanism has been a modern reincarnation. A style of 'water-bagger' day racer and ocean racer has been developed through the 1990s that now loads and shifts water ballast from side to side exactly as the sandbaggers shifted sand or gravel ballast 150 years ago. Like the sandbaggers, they are wide, light, flat, and carry minimum ballast in light conditions and move maximum ballast to the windward side when sailing to windward in strong winds. The dynamic result is the same – the modern water-baggers enjoy superior sail-carrying power to total weight ratios and have abruptly begun to sail much faster than their lead-on-fixed-keels rivals.

The fourth reincarnation of the sandbagger is in the form of a vintage revival. Peter Kellogg has built two replicas of the biggest (30ft) craft; these sail at various venues. In about 1999, the venue was the Manhattan Yacht Club in New York; it ran a programme in which the two sandbaggers were called *Bull* and *Bear* and were joined by a chase-spectator-rescue powerboat, *Greyhound*. A club-sponsored programme encouraged those interested to first become club members, then spectators, then rescue crew, then sandbagger sailors, etc. This restored, for a year, not only the sandbaggers and sandbagger sailing to New York harbour, but also generated a growing support base which ranged from local enthusiastic spectators and crews to helmsmen. There were challenges by international teams, and in this way many contemporary sailors learned the art and techniques of racing these 'extreme and dangerous' sailboats.

It may be that some future archaeologist will assert that Egyptian skippers shifted slaves as ballast for speed as they raced flotillas of dhows up and down the Nile for the Tutankhamen Gold Cup in 2347 BC. Meantime, we believe that the sandbaggers of New York and the skiffs of Sydney were the world's first sailboats known to shift ballast to achieve dynamic ratios superior to conventional practice and so sail faster.

1.5 ■ The North American inland lakes

The Inland Lake Yachting Association's recently published *History of the Inland Lake Yachting Association*[2] notes that Wisconsin began to attract settlers in large numbers in about 1835. Many of the lakeshore settlements could be reached only by water, so substantial workboat building and sailing was an integral part of the growing economy. Into this environment, the 1851 triumph of the schooner *America* in England acted as a catalyst, and organised sailboat racing developed quickly.

I quote from the ILYA history: '*America*'s victory started a wave of interest in the sport which moved across the country. When it reached Lake Winnebago it changed Neenah's summer pastime into her major sport.' This typifies the further dimension that sailing added to the leisure and social culture of many lake communities. Both the technical expertise of sailboat handling and racing, and the management and social expertise involved in organising sailboat racing at a consistently high level, became socially important. Fig 1.4 shows the ILYA's oldest major trophy, the Sheridan Prize (donated in about 1870). It is a hand-crafted sterling silver model of a sandbagger, large and beautifully accurate – the sort of trophy that has always been massively expensive. Nothing could better attest that by the 1870s sailboat racing had grown to the point where it was not only popular, but had become culturally important in these inland lake communities.

Fig 1.4 The Sheridan prize

Lake Geneva's coveted Sheridan Prize – a sterling silver model of the sandbagger *Nettie*. Courtesy of Lake Geneva Yacht Club.

Chapter 1 of the ILYA history is titled 'Before Scows'. In the late 1800s, the fastest sailboats known were the sandbaggers of New York. What we now see is that at exactly the time the sandbaggers were being pushed out of the Hudson river estuary by prejudice, a demand for them had grown in the inland lakes. They were eagerly purchased from the east coast and became known in the lakes as 'gravel wagons'. (The original bags of sand stayed wet and the fabric quickly rotted. Gravel dried more quickly and the bags lasted longer.) Their numbers were not large but their reputation for speed is attested by the Sheridan Prize.

Chapter 2 of the ILYA history, 'The Scow is Born', and subsequent chapters, chronicle the beginning (in about 1895) of the development of a local style of lighter, flatter scows more suited to the flatter waters and generally lighter winds of the inland lakes. These boats were designed to 'measure short (upright) and sail long (heeled)'. As their proportions were refined, the lighter finer-lined scows became consistent winners. They sailed 'on edge' in lighter winds and planed freely offwind when a stronger wind blew. They proved faster than the more powerful sandbaggers (or any other boat) in the generally lighter-wind inland lake

[2] The Inland Lake Yachting Association's history reports famous scow builder John O Johnson as saying that *Yankee*, built by Eugene Ramaley of White Bear Lake in 1898 for Lucius Ordway, was 'the first true scow he had ever seen'. It is said that the design of *Yankee* was influenced by Herreshoff's *Alfrida*, launched the previous year.

conditions, and superseded them to the point where the flat 'skimming dish' scow design-style soon became, and remains, the quintessential inland lake sailboat.

Buddy Melges adds these comments:

The very first A scow was an offshoot of Seawanhaka sloops and a cross with Canadian design of the first scows. As the competition grew for the Seawanhaka's Cup Challenge the Canadians built flatter and flatter sailboats soon to be known as scows. Interestingly, the first scows crossed Canada from the East arriving in Kenora, Canada, then filtering down to St Paul, Minnesota. The Ordway family of 3-M Corporation was the promoter and John O Johnson became the builder.

Buddy Melges again:

These very first scows had centreboards and when heeled to proper angles for reduced wetted surface they made too much leeway. Johnny Johnson then solved this dilemma with bilge boards (two angled centreboards), one in each bilge. Immediate performance gains became evident. These first scows were able to plane in winds as low as 12 knots.

The A scow is 38ft long, 8ft 6in beam and carries approximately 500sq ft of sail. They very well could have weighed 3000lb. The Class has survived because of [the simplicity of] *its so-called 'box' scantlings. Any boat which could fit into a box 38ft x 8ft 6in by a certain depth was an A scow. In fact in later years the E, C and M scows followed the same box scantlings which allowed all classes to keep current within the box. Certainly our present scows are very different and certainly much faster than those of 1890.*

Most of all the scow class, spinnaker or no spinnaker, sailed pretty much square to the true wind when running free before the wind. It was not until after World War II that so many performance advances were instituted.

Sail material improvement had much to do with boat speed. Stiffer materials that became more stable allowed for greater girths. Rigs were improved by flexing in order to shift gears as wind speed changed. Sail design had to be changed to compensate for bendy rigs and sail material became a very important part of the formula to new-found boat speed.

The scows being long, flat and minimum sheer height were well suited for the lakes of Minnesota, Wisconsin, Illinois, and any protected body of water. They were never popular on Lake Michigan because of its bigger waves, but in the smaller lakes in the state of Michigan the scows have thrived.

As a youngster aged 20 in 1950, and having a father who was very innovative, we began to copy our iceboat techniques for downwind sailing. We ventilated our sails by sailing close to true wind angles and therefore the increased boat speed moved the apparent wind forward. This new practice found our downwind track to first be high then almost matching the square runner because our speed was twice that of his, our sails sheeted more firmly and obviously brought the apparent wind forward of the beam. To say the least, we began to dominate the racing and even though we shared the information and coached it, it seemed like we always had the upper hand. Possibly it was because of the performance advance going into our production boats and sails and as designers we had a greater feel of what we were trying to accomplish in the fooling of Mother Nature.

1.6 ■ The skiffs of Sydney

Like the sandbaggers, the skiffs of Sydney come to notice about 1800 as the workboats that serviced the square riggers plying the growing port of Sydney. Before long, the skiffs also engaged in racing. They too re-rigged with lighter spars and progressively bigger sails for the weekends' competitions.

Few waterways in the world can showcase sailing as can Sydney Harbour. In most harbours the shores are flat, the view horizontal, and tactical subtleties cannot be seen by any distant viewer. Sydney is different. The warm summer climate is governed by the fact that the great dividing range is only 50 to 100 miles to the west, these hills are low enough for the prevailing westerly winds to blow over them and subside and warm, and become relatively cloudless as they flow down towards the sea. This gives rise to the characteristically clear skies and intense heating of the littoral, and this heating leads to the Australian east coast's prevailing strong regular summer afternoon sea breezes. Added to this is the topography of Sydney Harbour, which is a broken steep-sided fault aligned into the northeast through a 100m high plateau (see Fig 1.22). Down this valley the regular sea breeze funnels at an average 12 knots on summer afternoons. To cap it all, the steep high shores offer myriad

Fig 1.5 Skiff crew 'stacking'

This is *how* they sailed, stacked two or three deep on the gunwales. Photo from *Blue Water Bushmen*, courtesy of Bruce Stannard.

vantage points from which those who know sailing and the sea can look down on the racing skiffs and, because they are looking down, can follow the tactics as they tack and gybe in a way not possible where shores are flat.

Bruce Stannard's classic *Blue Water Bushmen* opens:

> *In the mythology of Australian sport, there are few legends more colourful or enduring than those which surround the great sail-carrying open boats. Throughout most of the nineteenth century, long before cricket and the turf became obsessions in the infant colony, vast crowds jammed every vantage point around Sydney harbour to gape at and to gamble on the incredible antics of the men who dared to race the big boats.*
>
> *In the 1850s Sydney is said to have had more amateur and professional sailors than any other city in the world.*
>
> *The twenty-four footers often carried up to twenty men – great chunks of 'live ballast' squashed triple-banked on the gunwales* [see Fig 1.5].
>
> *The boats were huge, powerful, beamy and very, very wet.*
>
> *They set colossal clouds of sail upwind and more before the breeze* [see Figs 1.6 and 1.7].
>
> *Long before spinnakers were invented they set their extras square-rigged on heavy spars like the great clipper ships.*
>
> *Judged by today's standards they were alarmingly, magnificently over-canvassed. Sometimes the boats simply buried their bows and drove themselves under.*

What was happening here was that while the skiffs and the sandbaggers both shifted ballast, the two groups employed different techniques. This was because the skiffs' big crews themselves constituted both more ballast – much quicker-moving ballast – and a huge skilled-sailor labour force to hoist and trim extra sail downwind. The sandbaggers had none of these advantages.

So in lighter winds:

- The sandbaggers sailed light by carrying minimum ballast and minimum crew, and set no more sail (always main and jib only, plus perhaps a gaff topsail).
- The skiffs reduced weight by carrying fewer crew, who set huge amounts of extra sail, particularly when sailing downwind.

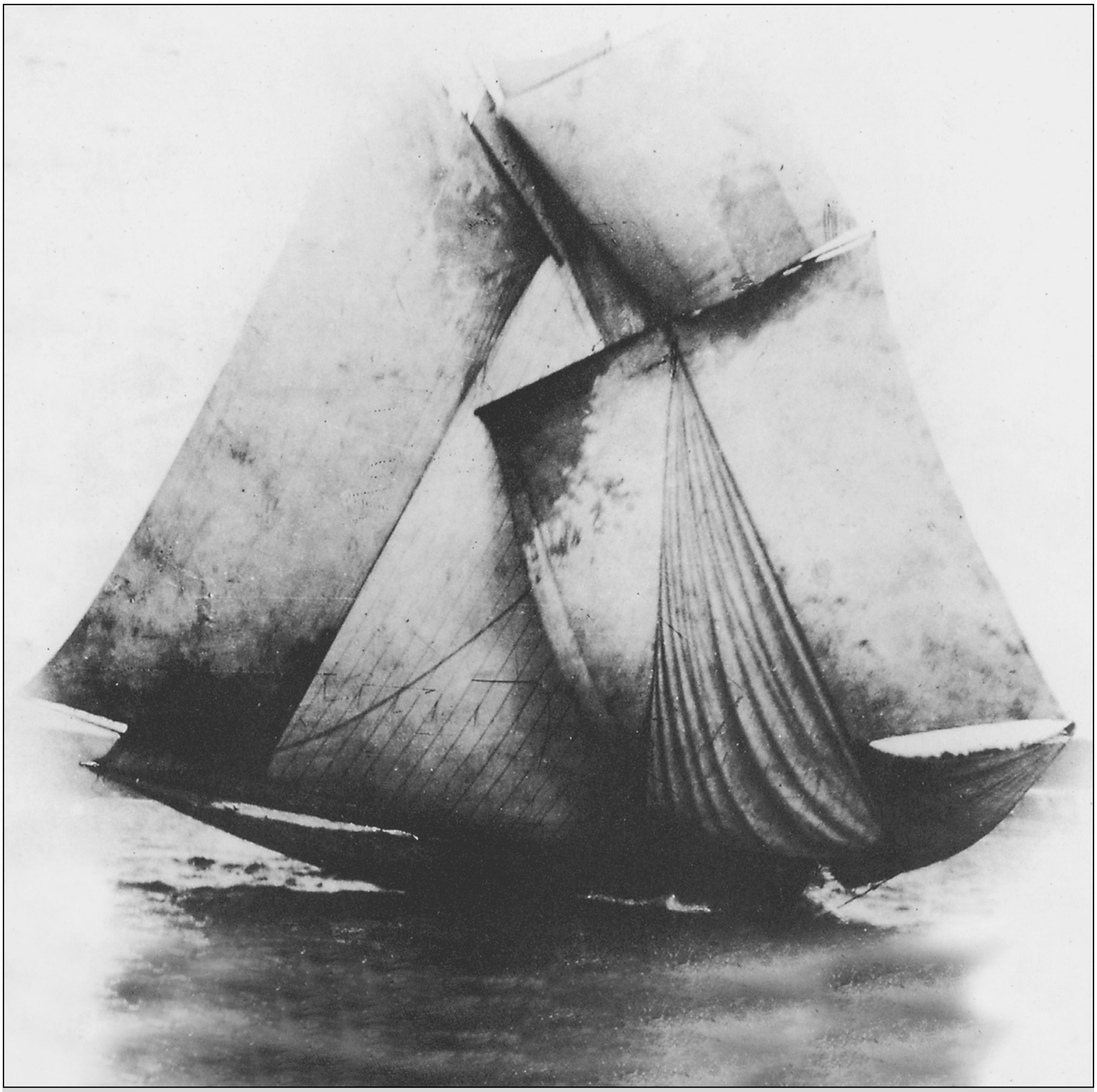


Fig 1.6 Skiff with square extra

This is *what* they sailed; the year is 1889 – everything up. Photo from *Blue Water Bushmen*, courtesy of Bruce Stannard.

And in stronger winds:

- The sandbaggers reefed sail and carried more ballast and more hefters.
- The skiffs carried more crew for ballast and set a little less sail.

There was a difference too in the dynamics. While the skiffs and the sandbaggers used the same principle of shifting ballast, the method was different because the sandbaggers were decked. A small crew in the cockpit hefted inert bags of gravel from the leeward onto the windward decks which were shaped and strengthened to receive it.

There is a limit to how much weight even the strongest man can heft between tacks when short tacking, and this limit to how much ballast could be shifted became the 'natural' limit as to how much sail a sandbagger could carry.

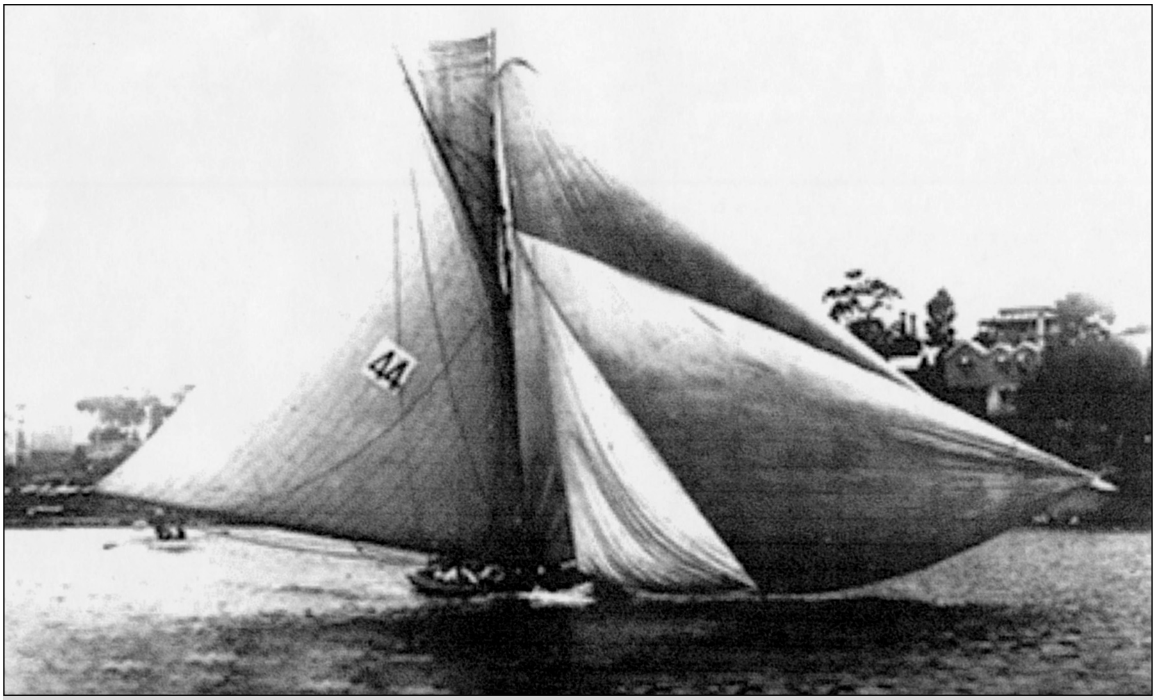


Fig 1.7 A skiff with spinnaker

This is *what* they sailed; the year is 1890 with the then new triangular spinnaker. Photo from *Blue Water Bushmen*, courtesy of Bruce Stannard.

The skiffs had no decks and were completely open, so that large crews could move their own weight on their own feet very quickly from side to side and right onto the windward gunwale. The first there sat on the gunwale and those who followed sat on those already there – it was called 'stacking'. Sometimes skiff crews stacked three deep, and Fig 1.5 shows this way of sailing in action.

Sixteen normal adults weigh about a ton, and big men obviously weigh more. A crew of 20 on a 24-footer constitute 1¼–1½ tons of live ballast that can move very quickly, so the skiffs could – and did – shift more ballast quicker and further outboard, and so were able to carry far more sail than the sandbaggers. Further, the big crews were themselves a substantial labour force, so the big skiffs were also able to set and drop multiple extra sails on the long downwind legs.

To keep them from swamping when they heeled, 'lee-cloths' with props were attached to the gunwales. The leeward lee-cloth, propped upward and inward, acted as a leeward deck to keep water out of the hull when the boat heeled (Fig 1.5).

Fig 1.6 shows a 22- or 24-footer, in 1889, a period when some boats still used a square extra sail and some used the then-new triangular spinnaker. The jib, completely blanketed, is limp. To the right of the lower jib a water sail is set from the end of a square sail lower yard which is attached to the mast. Above the water sail is a huge square sail skewed out to windward. Above the square sail is another light square sail called a 'raffee', set from the top of the jackyard of the topsail. A topsail is set between the gaff and a jackyard which extends the mast upward. A huge 'ringtail' is set on light yards between the peak of the gaff and the end of the boom. This greatly increases the area of the mainsail. A second watersail is set along the full length of the boom under the mainsail. Zorba might comment: 'The full catastrophe'.

Fig 1.7, from 1890, shows what the then-new triangular spinnaker version of the rigs of that era looked like.

The skiffs, like the sandbaggers, sailed faster than any conventional boats, but in Sydney there were so many skiffs that the real problem was that there were too many boats and too little organisation. The skiffs ranged from the tiny 6ft class through the 8s, 10s, 12s, 14s, 16s and 18s to the big 22- and 24-footers. There were so many skiffs that the skiffs were the norm, but they were anarchic and, as a result, the whole sailing activity suffered serious and repeated organisational problems typical of early growth. The problem was that while the Sydney sailing scene of the 1850s to the 1890s was vital in the extreme, and concentrated, it was so diverse within itself that no single organisation could manage the competing interests of the different classes to everybody's satisfaction.

The yacht owners and their families valued social interests. The smaller 6, 8, 10 and 12 foot open boat classes were extremely numerous and needed local races, but their emphasis lay in 'local', and they needed sheltered waters.

The bigger 18, 22 and 24ft classes were very conscious of their image and public drawing power. They demanded regular well-organised races in the stronger wind and bigger wave 'showcase' area of the harbour.

Between the years 1856 and 1890, six clubs were formed, but all failed within a few years. It seems each of them tried to be all things to all sailors, but in practice their management policies pleased so few of their members that they failed to command authority and were unable to control their fleets effectively – hence the failure.

There was one exception, though. The Sydney Yacht Squadron (later the Royal Sydney Yacht Squadron) had been formed in 1862. It tried a different policy, by focusing exclusively on the needs of yacht owners, and never mind anyone else. This policy worked. The Squadron thrived – and thrives to this day; the lesson was not lost.

Because of the seminal importance of the Eighteen footer skiffs 100 years later, it is worth taking a moment to look at how and why they became so dominant.

A far-sighted businessman, Mark Foy, stabilised skiff organisation by employing the same policy of focusing on one class, and to this he added two brilliant promotion techniques. In 1891 he provided the financial support to form the Sydney Flying Squadron. It is now Sydney's oldest open boat club. The two new promotion techniques were:

- He encouraged the Flying Squadron's boats to carry big distinctive insignia on their mainsails so they could be instantly recognised at a distance by the onlookers ashore and the punters on the following ferries.
- He introduced what has locally been called ever since the 'Mark Foy start', in which handicaps are applied at the start, with the slowest boat starting first. The revolutionary change was that the first boat across the line became the winner.

These two innovations revolutionised the image of skiff sailing and turned it into an exciting mass spectator sport. The insignia enabled spectators and punters to identify and follow during the race the fortunes of any boat in which they had an interest. The Mark Foy start took all the mystery out of unknown handicaps applied after the finish. Sailboat races were suddenly transparent, vital, and exciting to watch. If crews sometimes pushed too hard and drove their boats under, that was just another part of the new vitality.

The Flying Squadron organised regular races in the most spectacular area of the harbour. Of critical importance, Mark Foy funded prize money of £20 each week – which was ten weeks' wages for a tradesman in the 1890s – and he kept this up until the club was self-sustaining. This incentive not only enabled the club to schedule regular races; the constant financial incentive lured the top open boat sailors away from other clubs and other classes, and soon established the Flying Squadron as the pre-eminent club for development, speed, spectacle – and gambling. Mark Foy had found and applied a management format that has endured for a century and become a part of the life of Sydney town.

That it was the Eighteen footer class and boats rather than the glamour 22- or 24-footers that were chosen turns out to have been almost accidental. In electing to try the same approach that was by then working with the Sydney Yacht Squadron, Mark Foy needed a vehicle to solve the previously intractable organisational problem.

What is not clear, even now, is how and why the Eighteen footers became blessed. In the 1890s, the 22- and 24-footers were the glamour skiffs, and Mark Foy himself owned more than one. It seems that he may have chosen the Eighteen footers precisely because the glamour 22- and 24-footer classes were more strongly 'organised' within themselves and were resistant to change, while the Eighteens of that period knew that they were 'orphans', and were amenable to being managed.

The history is that within a few years the dominance of the 22- and 24-footers withered, and the previously unremarkable Eighteen footer class, with their new insignia and Mark Foy starts, had become not only dominant but enormously innovative. They have remained so for a century. In this way, Mark Foy engineered the enshrinement of Eighteen footer skiff sailing as a part of the life of Sydney.

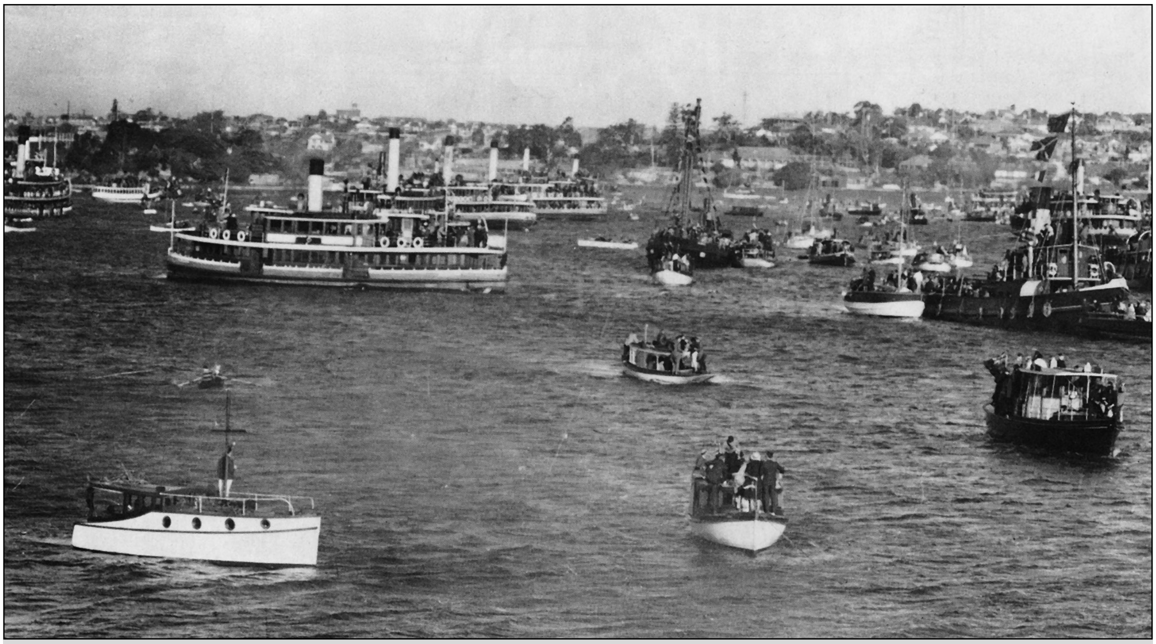


Fig 1.8 Spectator fleet

This is *why* they sailed; the skiffs and their crews enjoyed iconic status; spectators crowd the finish.
Photo from *Blue Water Bushmen*, courtesy of Bruce Stannard.

Fig 1.8 attests that wherever spectacle is exciting, thousands will gather to watch. The Sydney skiffs were the world's first movable live-ballast sailboats. Their dynamic 'sail-carrying power to total weight' ratios were superior to conventional practice, they set more sail and sailed faster, and their greater speed and spectacle aroused great public interest. Fig 1.8 shows nine large ferries, three tugs and many smaller craft, all full of spectators, waiting at the finish line of an Eighteen footer Australian Championship race in 1924. Because of this mass level of support, they were encouraged to race regularly and publicly and, over time, achieved iconic status in Sydney.

Both the sandbaggers and the skiffs used movable ballast and bigger sails to sail faster. They were each the fastest sailboats of their size in the world, and the state-of-the-art message as the year 1900 approached was: 'To sail faster, move ballast and set more sail.'

THE PLANING EXPLOSION – 1895 TO 1905

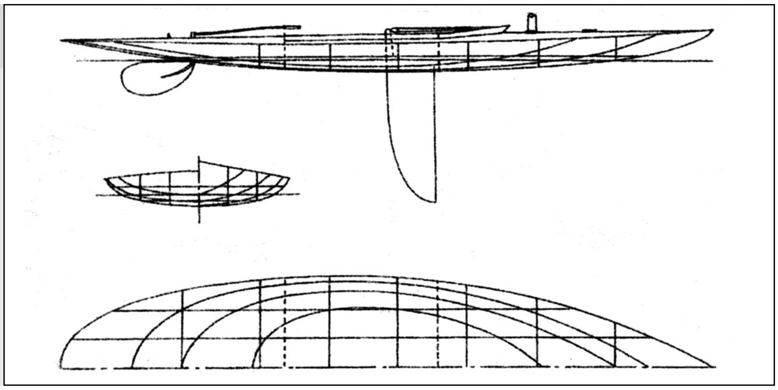
1.7 ■ England – first stirrings and private planing

The first planing sailboats probably sailed alone, in private. In the late 1800s a type of fowling craft, the Norfolk punt, was used on the Norfolk Broads. They were flat bottomed with rounded ends to nose through the reeds; some of them were 'long, narrow and fleet, rigged with a small leg o' mutton sail and steered with an oar through a quarter rowlock'. What we are describing here is a primitive sailboard, and there is no way such a craft would not have planed fast with a good wind on the quarter. But their owners' objective was to shoot waterfowl and not to race other punts, so they probably planed alone.

Many years later wider punts specially designed for sailing round the buoys with centreboard and rudder and an efficient rig became an established class. Norfolk Punt class No 1, Shrimp, is in the UK Maritime Museum; and Mike Evans, who for many years was Executive Director of the IYRU, owns one of these boats. Concerning the planing performance of the earlier craft, Mike suggests that it was probably one of those things that was so commonplace that nobody ever thought to discuss it or record it.

Fig 1.9 1 Rater *Sorceress*

Designed in 1894 by Linton Hope. Courtesy of Robin Elliott.



Early records of planing-type hulls come from 1894. Creative designers – Linton Hope, closely followed by Arthur Burgoine, J M Soper and others – were designing unballasted 'A-raters' for use in restricted flat waters such as the Upper Thames (Fig 1.9). These boats were so perfectly adapted to their environment that they are still sailing, and I am advised that a mould has recently been taken from one hull so that cold-moulded FRP hulls will be available in the future.

Looking at their shape, it is self-evident that they must have planed freely and fast whenever they enjoyed a good wind on the quarter. The fact that the advent of planing in the UK tends to be associated with Uffa Fox's work 40 years later, rather than these early skimmers, suggests an absence of promotion rather than any absence of performance.

1.8 ■ New Zealand – Arch Logan, and the Patikis of Auckland

New Zealand offers a rich and complex history of early development of fast sailboats, and I am indebted to Robin Elliott for access to the extraordinary historical research conducted by Robin and Harold Kidd. What we now see is an explosion of creative design and sailing technology that started in Auckland about 1895 and developed lighter, flatter, faster planing sailboats so quickly that by 1900 they were being exported to South Africa, Australia and Honolulu. But at home they were beginning to be resented – they were first excluded from one club in 1900, and by 1905 the uproar was such that they were excluded from virtually all of the sailing clubs of Auckland in a repetition of the fate of the sandbaggers of New York 30 years earlier.

Until 1893 there is no record of any substantial sailing in New Zealand in unballasted sailboats, then one boatbuilding family that became dominant – the Logans – plus another equally good – the Baileys – changed history.

In the years 1893 to 1896 the Logans built a number of 'half-raters', some to the design of William Fife (UK) but more and more to the design of Arch Logan, who with four of his brothers traded as 'Logan Brothers'. All of these boats could, in theory, plane in ideal conditions.

In January 1897, the American barque *Sea King* sailed from Sydney for San Francisco with a load of coal. Mid-Tasman, she met extreme weather which damaged her to the extent that she put into Auckland, New Zealand, for survey and subsequent repair. In February 1897 the master's wide flat unballasted American sailing dinghy, also named *Sea King*, was purchased by an Auckland sailor and sailed on Lake Pupuke. Figs 1.10 and 1.11 show views of this boat from abeam and ahead. The origin of its design is unclear. It was certainly not based on any sandbagger philosophy, nor was it remotely like the ubiquitous New Jersey 'sneak box' style of workboat. She was unusually beamy with wide side decks and a very low profile. Whatever its origin, the lively performance of this unballasted sailboat triggered something latent in Arch Logan's mind.

By the end of 1897, the Logans had built three unballasted half-raters for a new division of the North Shore club, and the Baileys built another. In no way were these boats copies of *Sea King*. What they *did* do was extend the unusual features of light construction and a relatively flat aft bottom to a new level.

The following year, 1898, the newly formed Parnell Yacht Club asked Arch Logan to design and build some boats suitable for their youth division. Logan's response was to design an 18ft flat unballasted centreboard sailboat which he called a 'restricted half-rater'. The design was a smaller development of one of the three built the previous year. The *Auckland Star* newspaper, reporting on a club meeting of 30 July 1898, stated, 'on

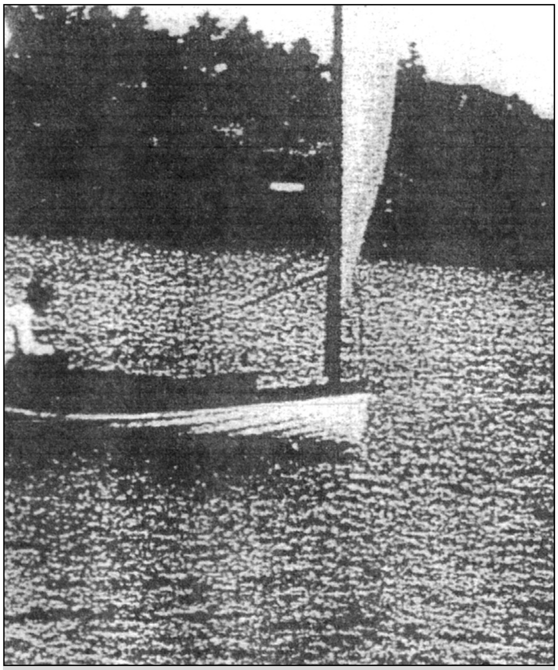


Fig 1.10 *Sea King*

Sea King sailing in Auckland, New Zealand, 1897. Courtesy of Robin Elliott.

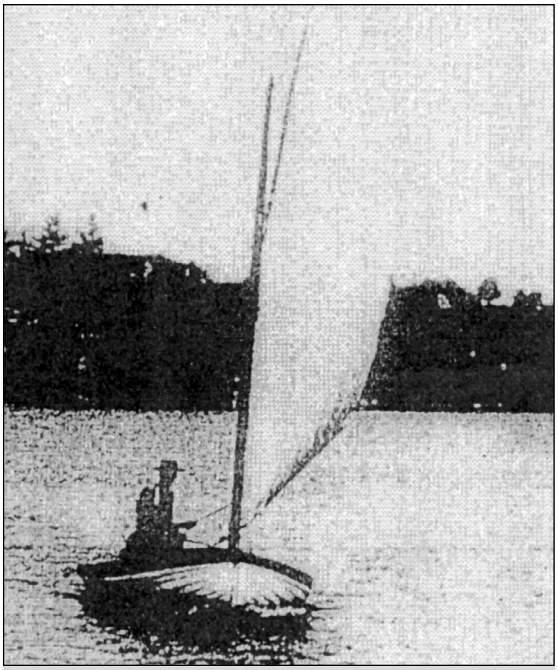


Fig 1.11 *Sea King* from ahead

Sea King viewed from ahead. Courtesy of Robin Elliott.

the suggestion of Mr T Ryan the proposed class has been given the appropriate name "Patiki", the Maori equivalent of "flatfish"'. ('Patiki' is pronounced Par-ti-ki, the 'a' in Maori being pronounced 'ar'.) Fig 1.12 shows one of these boats sailing in 1898, and Fig 1.13 shows the lines of a design by C J Collings, which was published in the American magazine *Rudder* in February 1905.

This exercise was innovative in five ways:

1. The first was that by this act the Parnell Yacht Club created New Zealand's first centreboard yacht class.
2. The second was the new flat, light, unballasted nature of the boats themselves.
3. The third was that this design approach gave this new youth trainer the ability to plane freely and thus offer a performance level far beyond the level normal to the adult conventional boats of that era.
4. The fourth was that, by consensus, 'restricted' rules were to apply to this class, rules that would require that all subsequent boats be very similar. Nowadays we would call these restrictions 'Class Rules', so this was a beginning of the 'Class' concept.
5. The fifth was to reinforce this idea of a class of similar boats with an appropriate name.

This design style was immediately successful. Six of the youth boats were built that winter, five by the Logans and one by the Baileys. In addition, two bigger, faster 22ft 1 rater and 1½ raters were built to the same design style. The genie was out of the bottle.

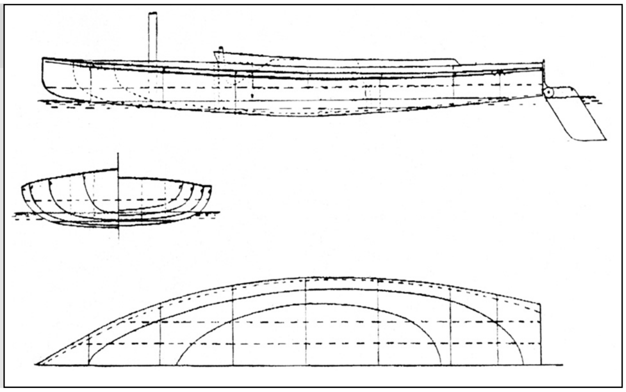
For the Intercolonial (Auckland/Sydney) championship of 1898–9 three 1 raters were built. Fig 1.14 shows a photo of Arch Logan's *Mercia* in Sydney a year later, and Fig 1.15 its lines. It did not win in Auckland, but was deemed the fastest boat. Along with the winner, it was sold to Sydney in 1899, where it dominated for a while. It was then sold to South Africa where it was re-named *Ibis*. Meanwhile, the Logans began to ship similar boats to Honolulu.

All heavy deep-bodied sailboats such as yachts with keels and the heavy sandbaggers, and the heavily crewed skiffs, sail through the water, and they suffer a very great increase in hull drag as soon as their speed exceeds that of a wave of their own length (see Fig 10.3). So in practice while those with bigger sails sailed faster than those with smaller sails, the speed differences were small and none of them ever sailed very fast on any point of sailing.

Fig 1.12 Patiki *Eka* by Logan Designed by Arch Logan in 1898. Courtesy of Robin Elliott.

Fig 1.13 Lines of *Maroro*

Lines of restricted Patiki *Maroro*, designed by C J Collings, published in *Rudder*, February 1905. Courtesy of Robin Elliott.



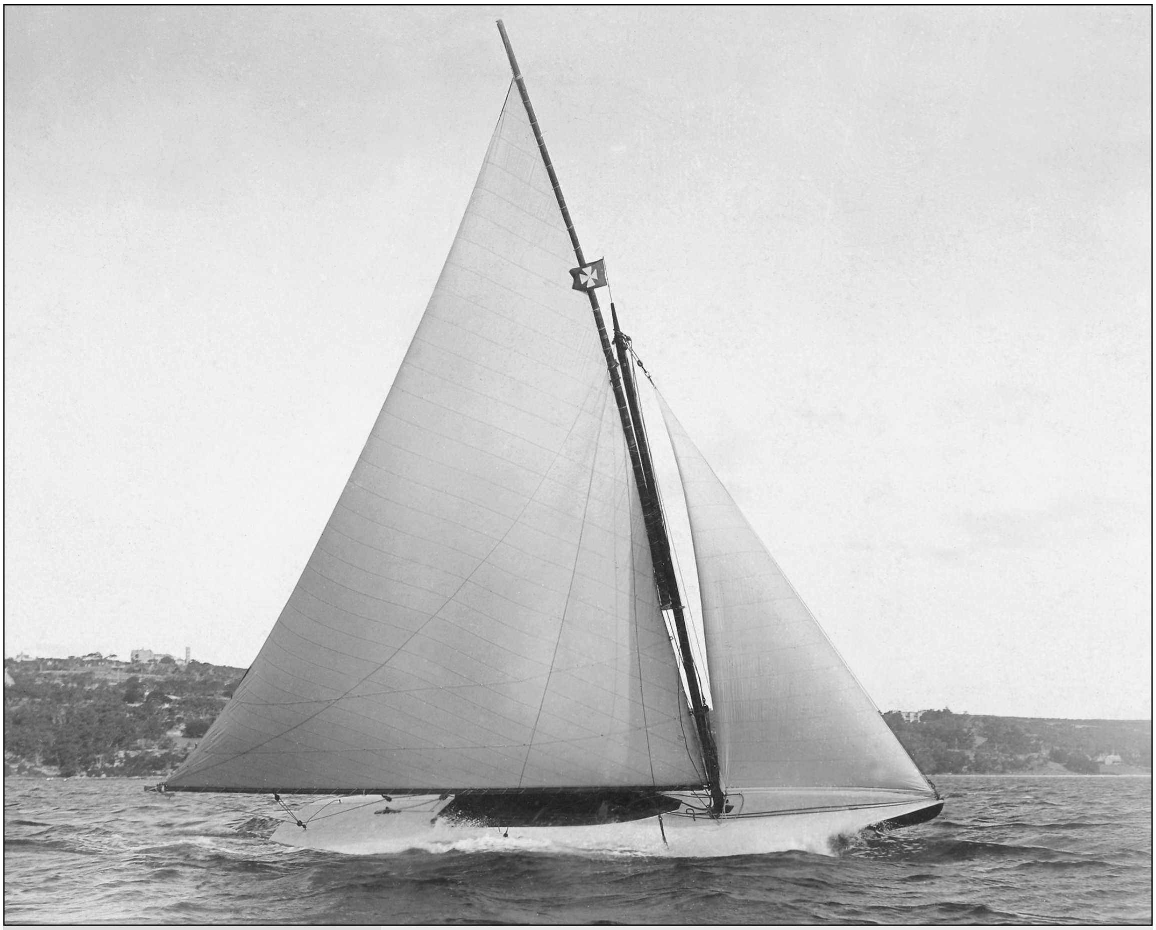
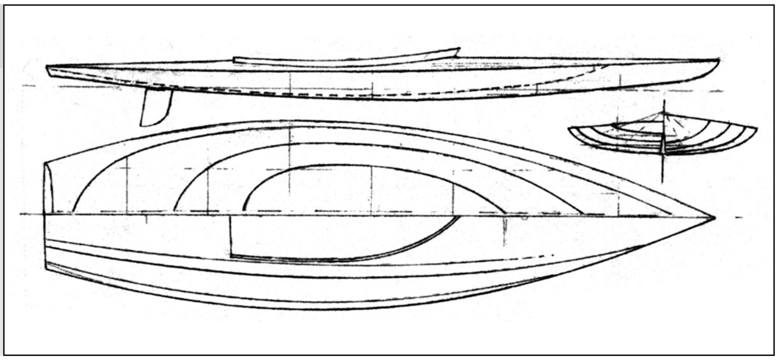


Fig 1.14 *Mercia* A W Crane racing *Mercia* in Sydney, 1901. Courtesy of Robin Elliott.

Fig 1.15 Lines of Patiki *Mercia*

Mercia designed by Arch Logan in 1898 (faded lines restored). Courtesy of Robin Elliott.



The performance of the new Patiki-style boats was beyond any previous experience. The new lighter Patiki-style designs with their flatter aft bottoms were able, for the first time in a sailboat, to avoid the crippling drag increase by lifting and skimming over the water instead of ploughing through it; so on broad reaches in a breeze, they were able to skim at speeds up to twice as fast as their conventional rivals. They were able to do this because of two innovations: the first was the shape of the aft bottom; the second was a construction innovation. The Logans and other Auckland boatbuilders began to use thinner (5mm) planking of lighter timber, together with lighter framing, and better engineering to make hulls that were much lighter than was customary, but still strong enough to offer a long racing life given care. Two men were able to lift one of these new 20ft or 22ft Patiki-style hulls when it was dry. They then went further and developed an

Fig 1.16 *Maroondah*

The Patiki *Maroondah*, at speed in Napier, New Zealand. Designed by Arch Logan in 1907. Courtesy of Robin Elliott.

even lighter and stronger structure with two even thinner skins, one diagonal, the outer one fore-and-aft, with oiled silk between, and all held together with myriad copper nails and roves. Fig 1.16 shows a 1907 Logan-designed Patiki, *Maroondah*, planing at speed.

In 1900 the offence of sailing too fast began to bite. Most of the members of the North Shore club were owners of 22ft mullet fishing boats known locally as 'mulleties', all of which carried some ballast for safety at sea. The ballasted 'mulleties' could not begin to match the reaching and broad reaching speeds of the new lightly built, finer-lined unballasted 'skimming dishes'. So, as in New York, the North Shore club voted to exclude future entries from unballasted Patiki-style boats from class starts for ballasted boats. While they remained in theory welcome to start in a separate race, the reality was that there were only ever one or two Patikis in any one of the five harbour clubs, so the practical effect was exclusion.

The name 'Patiki' suggested by Ryan for Logan's youth trainer was brilliant in that it encapsulated everything that was different about these new boats. So the appellation 'Patiki-style' quickly became attached to all new boats which 'had that look'. As a group, these Patiki-style boats had a problem – like the English International Fourteens of 30 years later, there were not many of them in total, there were never enough of them to form a class of their own in any one club, and it never seemed to have occurred to their owners to band together and form a club of their own or a separate class within a club.

For another five years, the Patiki-style was further improved, although not many were built. By 1904, a 24ft Patiki-style boat was conceding up to 96 (yes, ninety-six) minutes to conventional craft in club racing on the Manukau harbour west of Auckland.

Then came the coup de grâce and the riposte. The annual Auckland Anniversary Regatta was run by civic authorities so nobody could ever be excluded from proper entry to any of the classes. In 1905 in the 22ft division, three Patikis finished virtually together no less than 40 minutes ahead of the first conventional boat.

The uproar was huge! Their sin was to be so embarrassingly faster than all others in mixed fleets, and their fate was that henceforth entries from Patiki-style boats were not accepted from virtually all of the clubs around Auckland Harbour.

The decade from 1895 to 1905 saw explosive development in New Zealand from 'no record of planing' to the fully developed planing Patiki-style craft which was unbeatable in breeze and flat water. Arch Logan as designer was the giant who first saw the new opportunity and initiated dynamic change. The performance of his new designs in flat water and wind was so much faster than expected that they offended the Auckland establishment of the day to the extent that, like the sandbaggers of New York, they were excluded from club racing in Auckland Harbour.

1.9 ■ Canada – Herrick Duggan and the lake scows of Montreal

The Seawanhaka Yacht Club had sown the wind with its part in excluding the sandbaggers in 1882, and it was about to reap the whirlwind.

In 1895 the Seawanhaka Cup was presented by the club for competition in small boats, as an international match race series with challenge welcome from any club. In the same year, both the first challenger, from the UK, and the Seawanhaka defender had the relatively deep, narrow hulls typical of all coastal keelboats and the sandbaggers – that is, broadly similar to the underwater shape of Fig 1.2, or today's Yngling. These were the fastest, state-of-the-art boats of 1895. Seawanhaka defended successfully.

In the inland lakes, the deep heavy type of hull was beginning to be superseded by a lighter more lively type of boat. George Herrick Duggan, a civil engineer, had designed – and he and Fred P Shearwood had built and sailed together – a small yacht called *Gloria*, which dominated the racing on Lake St Louis, Montreal. Because of its long overhangs it was nicknamed 'the bug'. (Note Buddy Melges's earlier comment that scow-type design originated in Canada.)

In 1896 Royal St Lawrence Yacht Club tendered a challenge for the Seawanhaka Cup. Duggan had been Commodore from 1884 to 1890, and the notes that follow are drawn primarily from the club's beautifully presented history, *The Royal St Lawrence Yacht Club 1888–1988*. Chapter IV is titled 'Seawanhaka Cup: Days of Glory':

- The Seawanhaka defender, *El Hierie* (Fig 1.17), was designed by Crane to a 15ft waterline with 240sq ft of sail. The attitude within the club was that defence would be easy.
- Duggan elected to design a boat around a 12ft waterline and 300sq ft of sail. Fig 1.18 shows his challenger, *Glencairn*. It is already a lower, flatter, hull shape than either the 1895 challenger and defender, or *El Hierie*.
- The challenge awakened a ferment of innovation in the infant Canadian industrial machine. It became a matter of national pride that every part of the challenger should be 'Canadian made' – and in the end it was, even with the first challenger.

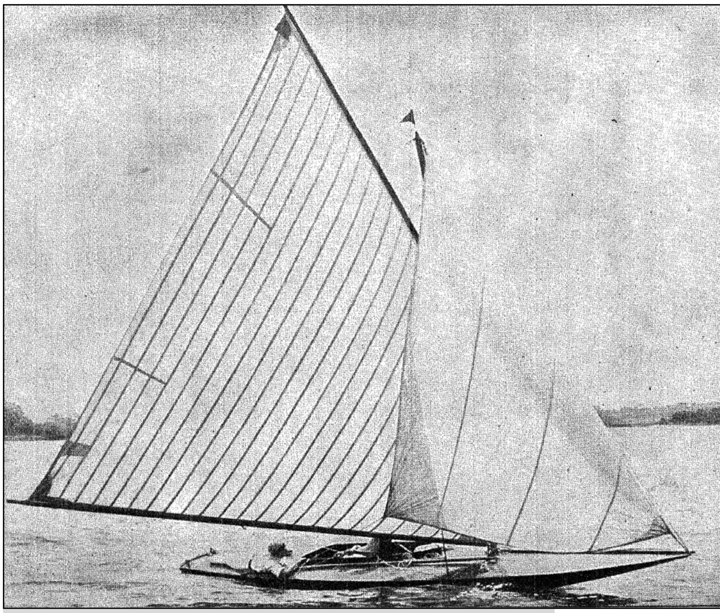


Fig 1.17 ***El Hierie***

Seawanhaka Yacht Club defender, 1896. Courtesy of C E Bolles.

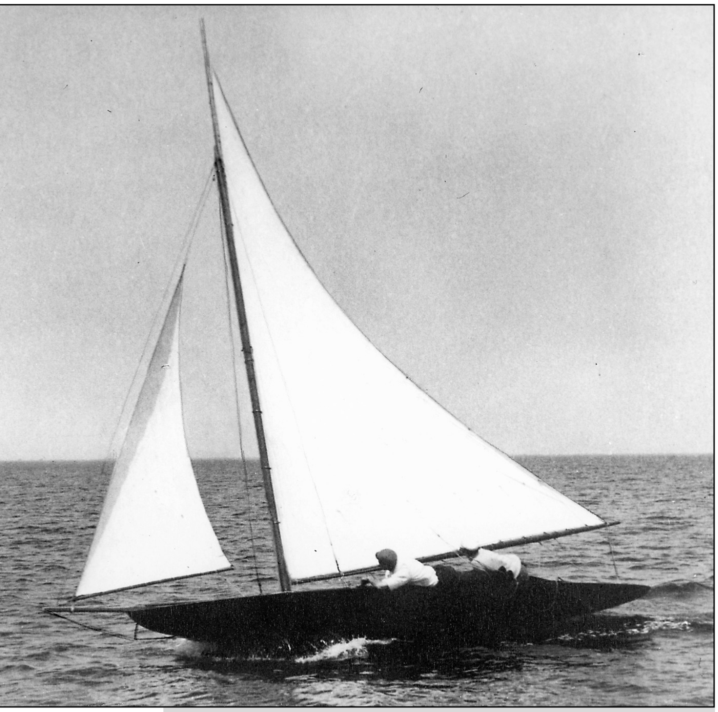


Fig 1.18 *Glencairn I*

Royal St Lawrence Yacht Club Challenger, 1896, designed and sailed by Herrick Duggan. Courtesy of Notman Photographic Archives, McGill University.

- Duggan was ably supported by Shearwood who, for the next nine years, acted as key helper in all things, built the boats and crewed with Duggan.
- *Glencairn* won the first race by 47 minutes. The record suggests that the defenders were so shocked that they did not regain their composure and sailed below standard in races two and three, which Duggan also won. The cup was now the Royal St Lawrence's to defend.
- Seawanhaka challenged in 1897, and put everything into the challenge. For Royal St Lawrence, Duggan defended with *Glencairn II* (Fig 1.19A), which appears to have been a detailed development of *Glencairn I*. The title of Fig 1.19B is confusing in that two different designs, or design studies, are shown. Both, though, are broadly similar and confirm the trend from the Vee bottom with deadrise of the sandbaggers and the Sydney skiffs, through the flat-bottomed scow, to the extreme of *Dominion* (see below).
- In *Glencairn II*, Duggan won again.
- Seawanhaka challenged again in 1898, and this time threw the challenge open to eliminations between challengers from any American club, so the Inland Lakes Yachting Association became involved. This was clearly starting to get serious. Some of the challengers were so flimsily constructed that they failed to survive the elimination series.

Fig 1.19A *Glencairn II*

Glencairn II. Courtesy of Notman Photographic Archives, McGill University.

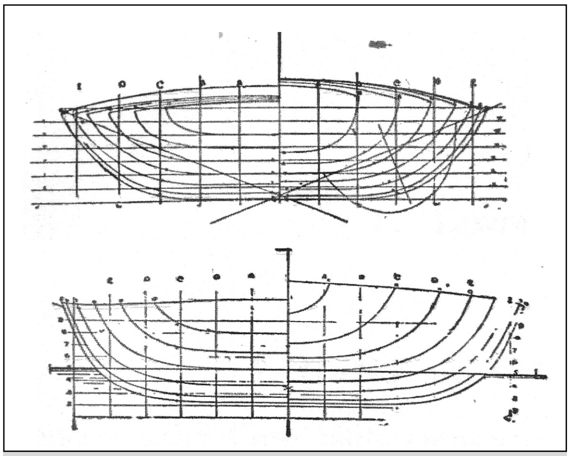


Fig 1.19B Sections of *Glencairn II*

These lines probably come from the magazine *Rudder*, 1897. Which one is *Glencairn II* is not stated, but both reflect the trend from the sandbagger shape through the scow shape to the *Dominion* shape. Courtesy of Robin Elliott.

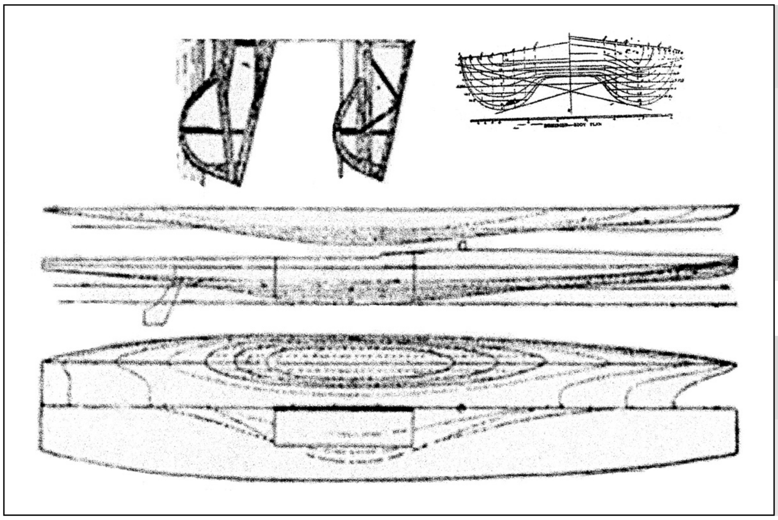


Fig 1.20A Lines of *Dominion*, 1898 (left)

Successful Royal St Lawrence Yacht Club defender. It was a brilliantly innovative boat. Designed and sailed by Herrick Duggan. Courtesy of Robin Elliott.

Fig 1.20B *Dominion* under sail (below)

Courtesy of Notman Photographic Archives, McGill University.

- For the Royal St Lawrence defence, Duggan created *Dominion*, a stunningly innovative design. Fig 1.20A shows the lines of this revolutionary boat, and Fig 1.20B shows *Dominion* under sail.
- Duggan won again.
- Following this challenge, the rules were 'adjusted' (read, 'if you can't beat them, ban them') to 'prevent the use of abnormal hulls such as *Dominion*, or flimsy designs such as *Seawanhaka* and *Challenger*'.
- Seawanhaka challenged again, and again employed the full national elimination process to secure the best possible challenger.
- For Royal St Lawrence, Duggan took the banning setback in his stride and built *Glencairn III* (Fig 1.21). Note how low and flat the hull shape has become, and that this boat is described by the magazine *Rudder* as a 'scow'. The transition from sandbagger to scow was complete. With it, Duggan won again.

And so it went on. Duggan designed, built, sailed and won the first challenge; he then designed, built, sailed and won the next five defences. He designed, and others sailed (and won), the sixth, seventh and eighth defences.

Fig 1.21 *Glencairn III*, 1899, under sail

Courtesy of Notman Photographic Archives, McGill University.

His craft were superbly proportioned and crafted for the light air, flat water, inland lakes sailing environment and his designs were tempered to the hilt as racing machines by the fire of nine successful international challenges.

This dynamic revolution in North America was taking place at exactly the same time as a broadly similar dynamic revolution was taking place in New Zealand, but from the point of view of the history of high performance sailing, the two thrusts were not the same.

In North America, Herrick Duggan was the giant who rewrote the book about what was fast in flat water, light air, inland lake sailing. He started from a near sandbagger displacement design in 1895 and finished with the modern lake scow. The scow is designed to 'measure short (upright) and sail long (on edge)'. When it is heeled and sailed on one bilge the wetted area is greatly reduced and the waterline length is greatly increased, so these boats enjoy lower drag up to higher hull speeds. This gives a higher ratio of sail area to wetted area, together with a lower drag than is possible with any 'upright' hull *of the same sailing length as the scow when heeled*. In the light airs and light to moderate winds and flat water that prevail in the Inland Lakes Yachting Association's area (generally the mid-west of the USA), this combination remains unbeatable. But for the reasons given in Section 9.9 (page 141) this approach is not efficient in either stronger winds or in waves, so Duggan's design solution, brilliant as it was for his area of the world, was not one that could be applied everywhere. Because of their shape, the scows planed freely offwind in the rare inland stronger winds, but in that area these are so rare that this was almost an accidental by-product. (The *Dominion* shape could not plane, but it did not matter.)

Arch Logan had sensed the planing potential of the *Sea King* shape and from that start point developed, over the next few years, a genre of fresh-wind planing sailboats that changed for ever the way sailors thought about sailboat speeds. But, like Duggan's approach, Logan's approach could not at first win everywhere.

At the stage both had reached in 1905, Duggan's lighter wind designs and Logan's stronger wind designs looked superficially similar, but their critical ratios were already very different. In Logan's case, in later years both he and others extended his initial work to create the vertical stemmed 'seagoing planer', and with this second development, the planing revolution was complete.

In 1895 the state of the art message had been 'To sail faster, move ballast and set more sail'. This message was true in both flat water and in waves. By 1905 it had become 'To sail faster yet in flat water, build light and flat. In lighter winds, heel. In stronger winds, plane'. This message was true only in flat water, and it was going to need another 30-odd years of further development before it would be true everywhere.

1.10 ■ The trickle-through decades – 1900 to 1950

In the years from 1905 to about 1955, the new planing designs were adopted with enthusiasm in New Zealand and South Africa and the Inland Lakes of North America, but not initially in either Australia or England, nor on the North American coasts.

It is easy to see why the British were cautious. Their climate is characterised by extreme variability. In special locations, flat-water boats like Linton Hope's I-Raters (Fig 1.9) were so good that they have satisfied their owners and their friends for more than a century. But a little further down the Thames, at Whitstable, conditions can be such as to capsize a big lifeboat end over end at a demonstration launch. It was going to need something more than I-Raters occasionally planing in their sheltered waterways to change the British mind.

The Australian situation was more complex. Most Australian innovation has come from Sydney, simply because far more sailing takes place there than anywhere else, and Sydney-siders have always been prepared to 'give a new idea a go'. But when you look at Sydney Harbour closely, it too has traps for the unwary. Fig 1.22 shows the shape of the 'showcase' area of Sydney Harbour. Of critical importance are the following factors:

- The prevailing summer afternoon sea breeze is a funnelling wind of 11 to 12 knots from the NNE.
- In this wind, Clark Island makes a natural leeward mark.
- The Sow and Pigs Reef, a little more than 2nm upwind near the heads, makes a natural windward mark.
- Shark Island makes a natural wing mark.

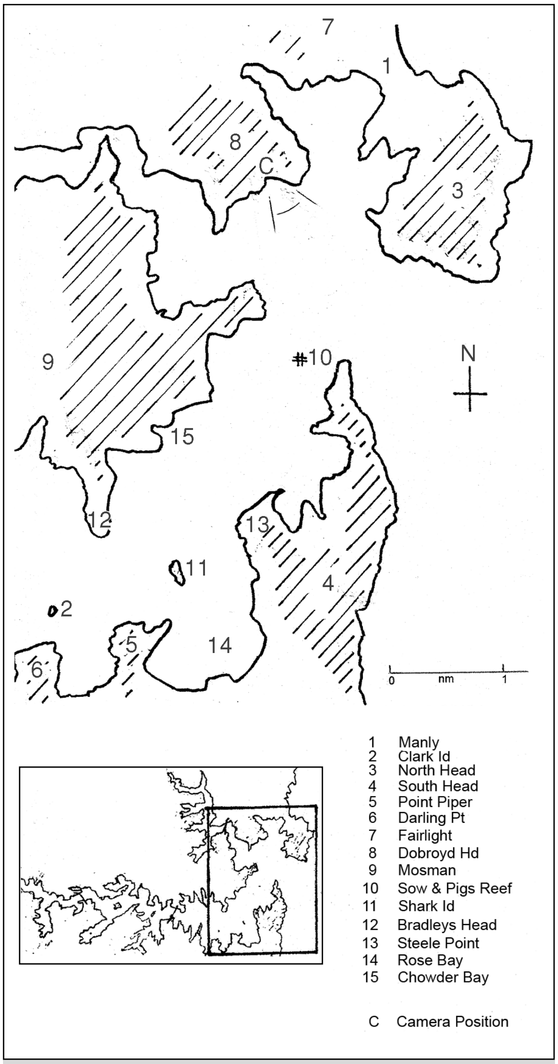


Fig 1.22 Map of Sydney Harbour

This has been the Eighteen footer No 1 course since racing began; it is sailed far more often than any other course. When Mark Foy set up the Sydney Flying Squadron in 1891 its No 1 course became three laps from Clark Island to the Sow and Pigs reef 2nm to windward and back, with a dig around Shark Island on the first and third laps to make it more interesting. At first glance this looks like the familiar triangle, sausage, triangle course. But when you look at it closely, it is dominated by a number of unusual factors:

- The windward/leeward leg is more than 2nm long. This gives a lot of time to set and strike the multiple extras shown in Figs 1.6 and 1.7.
- Even in the nominally triangular laps, the intervening headlands and the wind shadow areas behind Steele Point and Shark Island make the downwind legs more of a run-reach-reach-run than two reaches. This is critical.
- So, between planing Patikis (such as the 1899 *Mercia*) and the 1899 non-planing skiffs, the Sydney situation was heavily skewed in favour of the non-planing skiff. Specifically:
  - On the few occasions when a course other than the No 1 course was sailed, the Patiki simply planed away from the non-planing skiff on the broad reaching legs, and sailed about as fast as the skiff on all the other legs, and won comfortably.
  - But when the usual No 1 course was sailed, there were no long reaching legs to plane on. Further, when wind is against tide up and down the harbour, the wave height increases to the point where the flat-water scow-shaped Patiki would be slowed to windward by its greater wave impact drag in rougher water, so it probably sailed to windward more slowly than the vertical-stemmed skiff, and no faster on the run, where the skiff carried so much more sail, and the reaches were too short to be decisive. In these circumstances, the skiff would have won.
- So the overall situation was that on a few occasions the Patiki would win by a large margin, but most times the skiffs kept on winning.

This was not enough to persuade Sydney. Sydney and Australia, like Britain, stayed with what they had and waited until something more convincing came along. Nearly 40 years later, in 1938, it came.[4]

1.11 ■ The South African interest

While the South Africans do not appear to have contributed creative design in the quest for high performance, their story shows how closely the 'high performance sailing' centres were linked 100 years ago. The principal drive was the annual 'Interport Challenge' between Cape Town, Port Elizabeth, Durban and Mozambique. All of these sailing waters favoured flat-water planing craft. It appears to have started with Logan's *Mercia*, which was designed and built in Auckland in 1898, sold to Sydney in 1899, and then sold to Durban in 1904 where it sailed for many years, renamed as *Ibis*. From this start, a regular traffic arose in designs, kits and complete boats between Auckland and South Africa, with constant enquiry and occasional purchase of lake scows from Wisconsin and Minnesota. What happened in practice was that whoever lost the Interport Challenge approached a designer somewhere to design a boat to beat last year's winner. Rules were vague, requests such as asking the New Zealander Logan for 'an American style boat to beat xxx' are revealing, and innovation was imaginative.

Fig 1.23 shows a 1909 Logan scow, *Shingana*, at speed on the Zwaartkops river. Note the 'American style' twin canted bilge centreboards. All New Zealand craft used a single central vertical centreboard.

Fig 1.24 shows the lines of *Merlin*, designed by Arch Logan in 1912 for Jack Grice of Durban. The horizontal bow has become broader.

These scows remained a feature of South African sailing for many decades. One of my South African contributors, Dave Cox, started as a bailer boy on 'the last of the scows' in Durban in 1932.

[4] A century later, in January 2002, six New Zealand 'M' class 'Improved Patiki 18 footers' (see Fig 1.27), which are still popular in New Zealand, visited Sydney and enjoyed a two-week revival festival with the (then six) Sydney 'Vintage Eighteens'. They raced the same courses. It was of interest to both me and Robin Elliott, who was one of the 'M' sailors (and my guest), to observe how exactly the scenario above repeated. We can be confident that the analysis above is reasonably correct.